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*PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.*

*The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.*

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**79-1251.** Jenkins, I. D. (Sch. Sci., Griffith Univ., Nathan Qld 4111, Australia) **The chemistry of 2,4,5-T.** *Chem. Aust.* 45(12): 455-456; 1978. (9 references)

A brief review of 2,4,5-T, a selective herbicide is given. During the manufacture of this phenoxy herbicide, at least one highly toxic contaminant is formed, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). TCDD is extremely poisonous, and such poisoning is characterized by loss of body weight and delayed lethality. TCDD causes chloracne in man, monkeys, and rabbits. It is the presence of this contaminant in 2,4,5-T which may be responsible for the teratogenicity demonstrated in studies using 2,4,5-T. The industrial synthesis of 2,4,5-T is shown schematically. Probable steps leading to the formation of TCDD are outlined. TCDD can also be formed by the burning of 2,4,5-T. It has also been demonstrated that TCDD can be formed from 2,4,5-T ester and 2,4,5-TCP under photolysis conditions. TCDD is stable up to 800°C. In the environment it is slowly broken down, having a half-life in soil of about 1 yr.

**79-1252.** Done, A. K. (Sch. Med., Wayne St. Univ., Detroit, MI) **Solving the poison puzzle.** *Emerg. Med.* 11(2): 243-246, 251, 255, 259-261, 264; 1979.

A wide variety of poisoning symptoms and their possible toxicological causes, which can be helpful in diagnosis and treatment of accidental or intentional poisoning cases are discussed. Clinical diagnoses include general signs or symptoms (fever, odors, etc), skin and mucuous membranes, CNS (coma, ataxia, paralysis, psychosis, convulsions, dysphagia, tremors, and visual loss), gastrointestinal tract (gastroenteritis, salivation, dysphagia), respiratory system (labored breathing, edemas), cardiovascular system (hypertension, shock, bradycardia, arrhythmias). Clinical laboratory findings in urine, blood, liver function, and spinal fluid, and the use of ECG can be helpful in diagnosing a wide variety of poisonings. Cuasative agents listed along with their symptomologies include drugs, household products, pesticides, and food toxins.

**79-1253.** Crim, R. L.; Murray, T. M. (Office Water & Waste Manage., US EPA, Washington, DC) **Water monitoring: A dynamic process.** *Environ. Int.* 1(4): 183-194; 1978. (12 references)

Efforts being made to monitor the quality of the water are outlined. In various states, primary monitoring networks of ambient fixed stations have been designed to assess general water quality conditions within each state. The states are now responsible for the monitoring activities associated with this program. Wide legislative responsibilities have been given to the EPA for monitoring the water environment. Various federal agencies are also heavily involved in various water monitoring activities. The US Geological Survey, the US Soil Conservation Service, the US Fish and Wildlife Service, the US Forest Service, the US Army Corps of Engineers, the National Oceanic and Atmospheric Administration, the US Bureau of Reclamation, the Tennessee Valley Authority, and the US National Marine Fisheries Service are each involved. Much of the data collected through these various activities is stored in the EPA's computerized water quality storage and retrieval system, called STORET. A water quality file for the computer storage of water and water-related data collected through the activities of USGS also exists, called the WATSTORE. Monitoring programs under consideration for implementation in the future are briefly discussed.

**79-1254.** Tomatis, L. (Author address not given) **Unit of chemical carcinogenesis.** *IARC Annu. Rep.* 4: 77-113; 1978. (64 references)

The IARC Annual Report of the Unit of Chemical Carcinogenesis reviews the activities of the unit which will be continued in the direction of identifying potentially carcinogenic chemicals in the environment, evaluating their carcinogenic risk to humans, and developing criteria for assessing the significance of experimental results as they might apply to humans. The report gives an in depth look at the progress made in extrapolating data from carcinogenicity studies to humans by listing all the chemicals which have been studied by the IARC and naming the authors who have been involved in this work. Chemical screening tests have relied heavily on studies involving excision repair of DNA, mutagenicity tests for pesticides and other compounds with and without microsomal activation, and short term screening tests involving unscheduled DNA synthesis. A preview of workshops to be held, and new research in progress on prenatal carcinogenesis are also mentioned.

**79-1255.** Zullini, A. (Author address not given) **Inquinamento da pesticidi. [Pollution due to pesticides.]** *Inquinamento* 20(12): 28; 1978. (2 references) (Italian)

The general environmental problems of pesticides are described. The use of selective pesticides has gradually led to the development of resistant pest species, which may result in derangement of the biological equilibrium in nature. Pesticides cause pollution in soil and water, and some of them, especially organochlorine preparations, are highly persistent, and accumulate in the environment. The half-life of DDT in soil is about 10 years, that of dieldrin 20 years. Organophosphorus pesticides generally do not have long-term effects because of their rapid degradation, but they are highly toxic.

**79-1256.** Highland, H. A. (Stored-Prod. Insects Res. & Dev. Lab., Agric. Res. Sci. & Educ. Adm., USDA, Savannah, GA 31403) **Insect resistance of food packages - a review.** *J. Food Process. Preserv.* 2: 123-130; 1978. (21 references)

Food products may be protected from insect pests by the use of insect-resistant packaging. Some insects are successful in boring their way through package walls, and so pesticide-coated packaging materials have been approved for use in many countries. In the US, treatment of packaging material for the shipment of food is limited to pyrethrins synergized with piperonyl butoxide, because the pesticide coating may migrate into the packaging and penetrate the food inside. Some specie of insects can penetrate the food

inside. Some species of insects can penetrate most flexible films, papers, foils, and combinations of these wrappings. The most resistant polymer film to insect invasion is polycarbonate film. Polyester and polyester urethane films are also useful against insect penetration. The least resistant forms of packaging include the cellophane and paper wrappings. Another way to handle insect invasion during shipment of produce is the use of insect resistant shipping containers treated with chemicals. Physical barriers may also be effective such as insect-tight seals, polyethylene-overwrapped or fully taped corrugated cases and heat-shrunk film overwraps on pallet loads of bags or cases. Further methods of protecting large and consumer-sized packages of food from penetrating or invading insects are reviewed.

**79-1257.** Mel'nikov, N. N. (Author address not given.) **Pestitsidy v sel'skom khoziaistve Shveitsarii in 1978. [Use of pesticides in agricuture in Switzerland in 1978].** *Khim. Sel'sk. Khoz.* 16(11): 19-22; 1978. (Russian)

A review summarizing the data on the use of various pesticides in Switzerland is given. In 1978, the spectrum of pesticides cleared for industrial use included approximately 170 compounds (active ingredients). The majority of the organochlorine pesticides have been banned with the exception of the highly toxic compounds lindane, aldicarb, and carbofuran which are mildly persistent and degradable.

**79-1258.** Mellanby, K. (Author address not given) **Insecticide poisonings.** *New Sci.* 81(1139): 278; 1979. (1 reference)

In a letter to the editor, questions are raised about a previously reported estimate that 500,000 persons are either killed or incapacitated by insecticides every year. It is suggested that this figure may be erroneous in that the number of people killed by these chemicals may actually be around 500 and the number of those injured by insecticides seriously enough to be labeled 'incapacitated' may be in the same range. The use of DDT in the past 20 yr has been greatly curtailed because of its damaging effects to wildlife. However this insecticide is not considered to be as harmful to man as some of its replacements such as parathion, according to certain reports. It is pointed out that the advantages and disadvantages of the use of pesticides both have their consequences, and neither should be overlooked.

**79-1259.** Telling, G. M. (Unilever Res. Lab., Colworth House, Sharnbrook, Bedfordshire, MK44 1LQ, England) **Good analytical practice in pesticide residue analysis.** *Proc. Analyt. Div. Chem. Soc.* 16(1): 37-42; 1979. (4 references)

Analytical practices leading to reliable pesticide residue analysis depend on the analyst, the basic resources of the investigating laboratory, and the proper selection and use of analytical procedures. Guidelines for analytical procedures to be followed to conform with the regulations of the Codex Committee on Pesticide Residues are given. Adequate overlap and continuity of trained staff in the chain of analytical procedures is very important. The staff must be trained in basic, as well as advanced laboratory skills, methodology, and terminology. The lab and its fittings should be designed to allow the analyses to be done in a well defined area with maximum safety and minimum contamination. Equipment and supplies must be available in adequate quantities and of the highest quality. During analysis, contamination and loss of sample must be avoided; quality control in the form of validation methods and confirmatory tests must be maintained. Reports of results should always include methods, materials and procedures used.

**79-1260.** Luisi, N. (Ist. Pathol. Veg., Univ. Bari., Bari, Italy) **Prodotti sistemici in patologia vegetale, ecologia e adattamento dei patogeni. [Systemic products in plant pathology, ecology and adaptation of the pathogens.]** *Securitas* 62(11-12): 659-666; 1977. (13 references) (Italian)

The general ecological, hygienic and phytopathological aspects of the use of systemic fungicides are discussed. Whenever possible, systemic fungicides should be introduced directly into the soil, or be applied in granulated form to reduce wind drift and thus environmental pollution. Certain fungicides are metabolized by nonspecific enzymes in certain plants. The effect of benomyl at the cellular level calls for caution because of the possible acute toxic effects. As of 1972, certain organisms have developed resistance to systemic fungicides such as benomyl and its derivatives, thiophanates, dimethirimol, ethirimol, 6-azauracil, triarimol, oxathiins, chloroneb, Kitazin (IBP), and dichlozoline.

**79-1261.** Fischer, E. (Inst. Pharmakol. & Toxikol., Fak. Klin. Med., Univ. Heidelberg, Mannheim, BRD) **Arbeitsstoffe und Mikrosomenenzyme: Wechselwirkungen und ihre Bedeutung fuer das gesundheitliche Risiko. [Occupational materials and microsomal enzymes: interactions and their significance for health risks.]** *Zentralbl. Arbeitsmed. Arbeitsschutz Prophyl.* 28(12): 337-347; 1978. (73 references) (German)

Various mechanisms are found in the living organism to rid itself of toxic or foreign substances. The endoplasmic reticulum has many enzyme-catalyzed, nonspecific oxygenation and conjugation reactions to serve this purpose. Often the liver is the organ which is responsible for ridding the body of foreign substances. Frequently foreign materials undergo biochemical activation and result in products which may be more toxic to the body than was the original form. Cytotoxic, mutagenic or carcinogenic effects may be connected with exposure to certain toxic substances. Organochlorine pesticides have been cited as inducers of enzyme activity in humans and long exposures to these compounds may cause failure to respond to drug therapy. Other controlled studies in humans have shown that carbon disulfide exerts pronounced inhibitory effects, even at levels within the MAC range. The thiurams are also potent drug-metabolizing enzyme inhibitors. Further research should be conducted in the field of industrial toxins to thoroughly evaluate the possible effects of chemical inducers.

**79-1262.** Gaillardon, P.; Calvet, R.; Rougetet, E.; Gaudry, J. C. (Lab. Malherbol., Cent. Rech. Agron. Dijon, INRA, F-21034 Dijon, France) **Preliminary studies of the role played by the nature of organic matter in herbicide adsorption phenomena.** *Ann. Agron.* 29(3): 243-256; 1978. (19 references) (French)

The effect of undecomposed organic matter (2 organic substrates: wheat straw and alfalfa hay) on the adsorption of three herbicides (terbutryne, diruon, isoproturon) in a clay-loam soil was examined. An attempt was made to evaluate the role of the different fractions in the organic matter make-up by bringing about the decomposition of the same substrates in various mixtures. The variation in adsorbing properties in regard to terbutryne and diuron were determined concurrently. The presence of organic matter in sufficient quantity heightened the adsorption of herbicides in the order: terbutryne > diuron > isoproturon. This effect seemed independent of the fragmentation of organic material. However, it was linked to the nature of the herbicide and to the nature of the materials, with their chemical composition an essential factor. The transformation of the organic substrates, after mineralization, resulted in an alteration of the adsorbent power of the residual fraction and possibly led to organic substances more adsorbent than those used at the start. This variation in adsorbing power might depend on the nature of the substrate (direct and indirect action) and on the chemical nature of the herbicide and its affinity for some of the organic material components.

**79-1263.** de Campos, M.; Olszyna-Marzys, A. E. (Inst. Nutr. Central America & Panama, Gutemala City, Gutemala) **Contamination of human milk with chlorinated pesticides in Guatemala and in El Salvador.** *Arch. Environ. Contam. Toxicol.* 8(1): 43-58; 1979. (35 references)

In Central America huge amounts of persistent organochlorine pesticides are being used. This paper presents data on organochlorine residues in human milk. The samples studies were collected from areas with different spraying patterns. The results show very high contamination rates with organochlorine pesticides, especially with DDT. The highest levels were found in cotton-growing areas. Compared with residue levels in areas where cotton is not grown the difference was found to be statistically significant. Many of the quoted values are among the highest reported for the Western World. However, very high residue levels were also found even in Guatemala City, suggesting that other than agricultural uses of pesticides are important contamination sources. It is believed that these high levels of pesticide residues in human milk reflect a high contamination among the population in general. (Author abstract by permission)

**79-1264.** Yakushiji, T.; Watanabe, I.; Kuwabara, K.; Yoshida, S.; Hori, S.; Fukushima, S.; Kashimoto, T.; Koyama, K.; Kunita, N. (Osaka Prefect. Inst. Public Health, Higashinari-ku, Osaka, Japan) **Levels of organochlorine pesticides and polychlorinated biphenyls (PCBs) in mother's milk collected in Osaka Prefecture from 1969 to 1976.** *Arch. Environ. Contam. Toxicol.* 8(1): 59-66; 1979. (20 references)

Long-term investigations of polychlorinated hydrocarbon levels in mothers' milk were made from 1969 to 1976. The levels of *p,p'*-DDE, *p,p'*-DDT, dieldrin and PCB in mothers' milk were within the range reported by others. However, $\beta$-BHC (hexachlorocyclohexane) levels in the milk were 10 times that found in non-Japanese. A gradual decrease in the $\beta$-BHC level in the milk was observed during this period. In contrast, the levels of *p,p'*-DDE, *p,p'*-DDT, dieldrin and PCB were consistent for the 7-yr period. A significant correlation between the levels of PCB and *p,p'*-DDE in mothers' milk and blood was observed in the 1974-1976 samples. However, after prohibition of the use of chlorinated hydrocarbons, this relationship was less apparent in the 1972-1973 samples. (Author abstract by permission)

**79-1265.** Gile, J. D.; Gillett, J. W. (Terr. Ecol. Branch, Environ. Res. Lab., Corvallis, OR 97330) **Fate of $^{14}$C dieldrin in a simulated terrestrial ecosystem.** *Arch. Environ. Contam. Toxicol.* 8(1): 107-124; 1979. (16 references)

The disposition of $^{14}$C-dieldrin (HEOD) was examined in a Terrestrial Microcosm Chamber (TMC) model ecosystem consisting of a synthetic soil medium, agricultural crops, numerous invertebrates and a microtine rodent. Residues were determined in air, soil, water, plants, invertebrates, and tissues of the vole (*Microtus canicaudus*) and her offspring. Design considerations for this experiment were (a) whether the test system satisfactorily measured the fate of the material applied, (b) whether the results were comparable to field and laboratory studies of the rates and extent of movement, transformation and biological effects of HEOD, and (c) whether the TMC was comparable to other microcosm test systems. The average accountability was 89% of the $^{14}$C-dieldrin applied to three TMCs. At termination, the soil contained 55% (± 19%) of the $^{14}$C, plants 30% (± 18%) and fauna 1.5% (± 0.9%). The vole exhibited an average Ecological Magnification index of 59.5. An average concentration of 17.7 ppm HEOD was noted in the vole brain. Dieldrin adversely affected both vole survival and reproductive performance. The results in the TMC are highly consistent with the behavior of the chemical in the natural environment and in other microcosm systems. (Author abstract by permission)

**79-1266.** Newton, M.; Snyder, S. P. (Sch. For., Oregon State Univ., Corvallis, OR) **Exposure of forest herbivores to 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) in areas sprayed with 2,4,5-T.** *Bull. Environ. Contam. Toxicol.* 20(6): 743-750; 1978. (9 references)

This paper reviews the current research on the accumulation of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), a contaminant of the herbicide 2,4,5-T, in ecosystems. In one study, Sprague-Dawley rats fed a diet containing up to 210 ppt TCDD for their entire lifetime showed no irreversible toxic effects, but their livers accumulated TCDD residues nearly 25 times the concentration in the diet. In other investigations mountain beavers, cattle and deer feeding in areas

sprayed with 2,4,5-T were examined. Livers were normal, and TCDD analysis showed negative or negligible levels. It was concluded from these studies that TCDD contamination does not pose a threat to wildlife.

**79-1267.** Jackson, M. D.; Lewis, R. G. (Health Effects Res. Lab. US EPA, Research Triangle Park, NC) **Volatilization of two methyl parathion formulations from treated fields.** *Bull. Environ. Contam. Toxicol.* 20(6): 793-796; 1978. (4 references)

The rates of vaporization of two formulations of methyl parathion were compared. Tobacco plots were treated with 1.12 kg/ha of either encapsulated (ENCAP) form or conventional emulsifiable concentrate (EC) form. The air 1 m downwind from the plots was measured using a sampler designed especially for organophosphorus pesticides. Air samples were taken 0, 1, 3, 6 and 9 days post-spraying. The filter pads were Soxhlet-extracted, and the extracts were subjected to gas chromatographic analysis. On day 0, the methyl parathion concentration near the ENCAP field was one-half tht near the EC field, and on day 1 it was one-tenth. By day 9, the air concentrations were essentially the same near both fields.

**79-1268.** Suffling, R.; Smith, D. W. (Dep. Bot. & Genet., Univ. Guelph, Guelph, Ont., Canada) **The effect of Tordon 101 herbicide on soil organic matter balance.** *Can. J. Bot.* 57(2): 108-116; 1979. (9 references)

Tordon (picloram) 101 was sprayed along two power line rights-of-way, one old, one new, at a rate of 117 ml of herbicide per 25 x 5 m strip. A reduction in the thickness of organic matter was noted. Two years after spraying, many trees were growing in the areas, especially where mineral soil was exposed. The rate of decomposition of the organic matter was increased due to a rise in soil temperatures after shade canopies were killed by the herbicide. However, this elevation in soil temperature was not sufficient to account for the observed increase in decomposition. Decreases in litter and organic matter stimulate growth of trees. Successional growth must be allowed to the point where tree seedlings can no longer establish themselves. The action of Tordon is that it changes community metabolism, thereby pushing succession back to earlier stages.

**79-1269.** Kurzawa, Z.; Krzyminska, A. (Inst. Gen. Chem., Tech. Univ. Poznan, Poznan, Poland) **Determination of stability of *N*-monoalkyldithio carbamates in dilute aqueous solutions by means of the sodium azide-iodine reaction.** *Chem. Anal. (Warsaw)* 23(1): 177-180; 1978. (11 references)

The stability of *N*-monoalkyl dithiocarbamates in aqueous solution of pH 2.0-9.0 at low concentrations was examined using the iodine-azide reaction. The induction coefficient of the decomposition product, carbon disulfide, in the acid solution is 20-times lower than the induction coefficient of the *N*-monoalkyl dithiocarbamates making it possible to determine the stability of *N*-monoalkyldithiocarbamates in a simplified format with negligible error. The fraction of the undecomposed compound at a given time was then determined by means of the azide-iodine technique

**79-1270.** Sotitiou, N.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Ges. Strahlen- & Umweltforsch., D-8042 Neuherberg, BRD) **Verhalten von Harnstoff-Formaldehyd-Polymeren im Boden unter Freilandbedingungen. [Behavior of urea-formaldehyde polymers in soil under field conditions.]** *Chemosphere* 7(12): 935-940; 1978. (11 references) (German)

The metabolism and migration of $^{14}C$-labeled urea-formaldehyde polymers ($UF_2$, a pure polymer with a specific surface of 24.8 $m^2/g$, and $UF_3$, a polymer containing beech pulp, specific surface 12.7 $m^2/g$), which can be used as adjuvants in pesticide formulations, were studied in pots under field conditions over 2 vegetation periods. The substances were mixed into the sandy soil at a rate of 6-7 vol% shortly before the first vegetation period. Barley was used in the first vegetation period, potato in the second. The residual radioactivity found in the upper 20-cm soil layer, into which the preparations were introduced, was 96.7% for $UF_2$ and 93.1% for $UF_3$ during the first vegetation period, and 95% for $UF_2$ and 96.2% for $UF_3$ during the second period. The radioactivity found in the 20-50-cm soil layers was 1.7 to less than 0.1%. Up to 0.1% was found in the percolating water, barley and potato plants. The findings indicate that urea-formaldehyde polymers used in pesticide formulations are hygienically practically irrelevant.

**79-1271.** Addison, J. B. (1411 Oxford St., Halifax, Nova Scotia B3H 3Z1, Canada) **Application of Hueckel molecular orbital theory to the photodecomposition of pesticidal *N*-methylcarbamates.** *Chemosphere* 7(12): 957-965; 1978. (11 references)

The Hueckel Molecular Orbital (HMO) theory was used to study the photodegradation of *N*-methylcarbamate pesticides. The ground state bond orders and charge densities of the compounds were calculated and used to predict the observed photodecomposition products of carbamate photolyses in either aerated or degassed solutions at excitation wavelengths above 265 and 310 nm. The photodecomposition products were almost always identical to those predicted by HMO calculations. However, bond orders and charge densities alone were not sufficient in predicting all the observed photodecomposition products. Also, the formation of the product may be affected by the ring symmetry and positions of ring substituents on the parent compounds. Photodecomposition dynamics are considered for such carbamates as Phenmec, seven (carbaryl), metacrate (MTMC), Landrin zectran (mexacarbate), and metacil (aminocarb).

**79-1272.** Rappe, C.; Buser, H. R. (Dep. Org. Chem., Univ. Umea, S-901 87 Umea, Sweden) **Identification of polychlorinated dibenzofurans (PCDFs) in commercial chlorophenol formulations.** *Chemosphere* 7(12): 981-991; 1978. (11 references)

Chlorinated phenols contain a variety of contaminants. Two commonly used chlorophenol formulations were analyzed for their PCDF contamination. One product consisted of 2,4,6-trichlorophenate. The other product contained mainly 2,3,4,6-tetrachlorophenate along with 2,4,6-tri- and pentachlorophenates. A phentachlorophenate sample of US origin was also analyzed, along with these above two which were of Scandanavian origin. The 2,4,6-trichlorophenol contained at least 7 different tetra-CDFs, one of the major isomers co-eluting with 2,3,7,8-tetra-CDF. The 2,3,4,6-tetrachlorophenol contaned minor amounts of tetra- and penta-CDFs, the 1,2,4,6,8-penta-CDF being the only isomer identified. Analyses made of dust samples taken at various places in saw-mills where chlorinated phenols were used as fungicides showed the presence of PCDFs. The pentachlorophenol (PCP) also contained only a little of the tetra- and penta-CDFs, with the 1,2,4,6,8-penta-CDF again being the only isomer identified. The chlorophenols in these formulations differed in their degree of chlorination and were most likely synthesized in different ways.

**79-1273.** Molnari, G. P.; Del Re, A. (Inst. Chim. Org., Fac. Agrar. Univ. Catol. Sacro Cuore, Piacenza, Italy) **Residui di antibotritici in uve, mosti e vini. I. Determinazione gascromatografica di Vinchlozolin in presenza di dichlofluanid, folpet, captan e captafol. [Fungicide residues in grapes, must and wine. I. Determination by gas chromatography of Vinchlozoline in dichlofluanid, folpet, captan and captafol.]** *Chim. Ind. (Milan)* 60(9): 705-708; 1978. (18 references) (Italian)

Products such as Vinchlozoline, dichlofluanid, folpet, captan and captafol are used in viticulture to combat the damage wrought by the fungus, *Botrytis cinerea*. A specific method for a simple, sensitive and accurate evaluation of the residues of these pesticides in samples of grapes, must and wine is proposed. The extracts are obtained in satisfactory quantity by the use of benzene enriched with 4,4'-dichlorophenyl, and are analyzed by gas chromatography without preliminary purification. This leads to the quantitative determination of the various fungicides, whether they are present singly or jointly. Recovery rates for grapes, must and wine varied from 76 to 103%. Concentrations were on the order of 0.01-5 ppm for Vinchlozoline and on the order of 0.1-10 ppm for the other compounds. In the case of Vinchlozoline, the detection limit was 0.002 ppm without concentration or purification. Sensitivities registered 0.005 ppm for Vinchlozoline, 0.01 for dichlofluanid, 0.05 for captan or folpet, and 0.5 for captafol. The method appeared to be particularly effective for the analysis of fungicide residues in wines with a high alcoholic content.

**79-1274.** Gonczi, Cs.; Hollo, A.; Pasztor, Zs.; Ponyi, J. (Natl. Inst. Public Health, Budapest, Hungary) **A Balaton es a Harmas-Koros vizenek es elovilaganak klorozott szenhidrogen-szennyezettsege 1975-ben and 1977. tavaszan. [Chlorinated hydrocarbon pollution in Lake Balaton and the Harmas Koros River in the water and the biotype in 1975 and in the spring of 1977.]** *Hidrol. Kozl.* 58(11): 519-523; 1978. (13 references) (Hungarian)

Water samples and aquatic organisms from Lake Balaton and the Harmas-Koros River, Hungary, were analyzed for total DDT and lindane residues by a gas chromatographic method. The lindane levels in the water samples were 0.001-0.029 μg/l in 1975, and 0.002-0.015 μg/l in 1977. The total DDT levels were 0.004-0.021 μg/l in 1975, and 0.006-0.022 μg/l in 1977. In 1975, the total DDT residue levels were 1.64-3.58 mg/kg (on a fat basis) in crustaceans, 28.8-34.3 mg/kg in reed-grass, and 5.98-23.1 mg/kg in mussels. The corresponding lindane levels were 0.141-0.734 mg/kg in crustaceans, 5.8-9.04 mg/kg in reed-grass, and 0.697-1.34 mg/kg in mussels. The total DDT levels in fish were 3.24-22 mg/kg (on a fat basis) in 1975, and 0.82-17.8 mg/kg in 1977. Relative to wet organ weight, the lindane levels were 0.001-0.044 mg/kg in muscles, and 0.001-0.028 mg/kg in liver samples. The residue levels were highest in the fish at the end of the tropic chain. The lindane concentrations in the water and fish were lower in late summer than in the spring.

**79-1275.** Del Dot, M.; Stringari, G.; Avancini, D. (Consorzio Sanit Valle Adige, Trento, Italy) **Ricerca comparativa sui livelli di pesticidi clorurati organici di sintesi in compioni di popolazione urbana e rurale della provincia di Trento negli anni 1969 e 1977. [Comparative research on the level of chlorinated pesticides in urban and rural population samples in the province of Trento during the years 1969 and 1977.]** *Ig. Mod.* 71(8): 980-988; 1978. (31 references) (Italian)

This article compares two studies of the accumulation of chlorinated organic compounds in human fatty tissues conducted at 8 yr intervals in the region of Trento, Italy. In 1977, the tissues examined came from hospital biopsies on 29 subjects, men and women, city and country dwellers, ranging in age from 15 to 78 yr. The first investigation, in 1969, involved 31 persons in a similar population sample. Between 1969 and 1977, the incidence of BHC increased from 0 to 100%, that of lindane from 19.4 to 100%, that of heptachlor epoxide from 12.9 to 89.6%, and that of *p,p'*-DDT from 96.8 to 100%. While *p,p'*-DDE showed up in the totality of samples for both years, *o,p'*-DDT vanished, from 58.1% in 1969 to 0 in 1977. Aldrin, dieldrin, and heptachlor could not be detected in either period. Concurrently, there was a strong increase in the relative and absolute mean accumulation of residues (ppm) for BHC (from 0 to 1969 to 0.239 in 1977), lindane (0.006 to 0.193), and heptachlor epoxide (0.010 to 0.042). By contrast, *p,p'*-DDE decreased markedly (from 9.488 in 1969 to 3.411 in 1977) as did *p,p'*-DDT (from 2.220 to 0.878) and *o,p'*-DDT (from 0.088 to 0). In eight yr, the DDT total equivalent fell from 13.730 to 5.552. These differences may be explained by the drop in the use of chlorinated pesticides in the Trento area in the 1970's (from 4 to 1.5 or 2.0 kg/hectare). The authors also found that the ratio DDE/DDT, somewhat higher in 1977 (81.9) than in 1969 (77.3), indicates a continued intensity of DDT metabolism in humans

**79-1276.** Zayed, S. M. A. D.; Farghaly, M.; Hassan, A. (Reg. Radioisot. Cent., Dokki, Cairo, Egypt) **Chemistry and toxicology of pesticide chemicals. VII. Photodecomposition of leptophos.** *Isotopenpraxis* 14(2): 68-70; 1978. (14 references)

The ultraviolet irradiation of leptophos in thin layers of silica gel for a period of 1 hr did not have a significant effect on the insecticide, with only about 2% being transformed to the oxon. Exposure for longer times, up to 48 hr, revealed the formation of the oxon, *O*-4(- bromo-2,5- dichlorophenyl) phenyl phosphonothioate, and phenyl phosphonic acid. Exposure to sunlight for a 2 wk period yielded the aforementioned compounds, along with desbromoleptophos and *O* -methyl phenyl thiophosphonic acid. Leptophos appeared relatively stable on glass and plastic or quartz surfaces. On leaf surfaces the oxon was formed in a small percentage, and this represented the major transformation product.

**79-1277.** McCaskey, T. A.; Anthony, W. B. (Dep. Anim. & Dairy Sci., Auburn Univ., Auburn, AL 36830) **Human and animal health aspects of feeding livestock excreta.** *J. Anim. Sci.* 48(1): 163-177; 1979. (101 references)

Analyses of poultry feed and litter from five commercial farms for DDT and DDE residues gave detectable residues in only two of the litter samples (0.02 and 0.01 ppm) and in one feed sample (0.01 ppm). The curbed use of chlorinated hydrocarbon pesticides for agricultural purposes will probably result in a further reduction of these residue levels. The use of broiler litter containing negligible levels of DDT and metabolites for feed did not result in the accumulation of residues in liver or omental fat of steer receiving 25 or 50% of the broiler litter in the irrations. Similarly no increased in PCB, DDE, or metabolites was noted in tissues of fattening cattle fed 15% peanut hulls or corn cobs for 109 days. Feeding of poultry excreta at 32% in the diet of cows for 50 days resulted in illegal levels of PCB in milk fat. The poultry had been fed 20 ppm PCB in their diet which was 100 times the level permitted by FDA guidelines of 0.2 ppm for animal feed.

**79-1278.** Wendel, L. E.; Vinson, S. B. (Screwworm Erad. Program, VS-AH, APHIS, USDA, Mission, TX 78572) **Distribution and metabolism of juvenile hormone analogue within colonies of the red imported fire ant.** *J. Econ. Entomol.* 71(4): 561-565; 1978. (12 references)

The distribution and metabolism of the juvenile hormone analogue (JHA), 1-(4'- ethylphenoxy)- 6,7-epoxy-3,7-dimethyl- 2-octene (R-20458) was studied in *Solenopsis invicta* Buren. The JHA was formulated in once refined soybean oil and fed to adult workers of small colonies. Adult workers retained the largest amount of the JHA compared to other stages throughout the experimental period. The level of JHA in the larvae increased to 7% through 36 hr and then slowly declined. Pupae, queen, and egg stages received only traces of the radiolabel, most of which were metabolic products. The half-life of the JHA in these colonies never exceeded 2 days. Experiments designed to study the distribution of JHA fed to adults within an individual ant revealed that through 11 days over one-half the radiolabel remained in the crop. This radioactivity consisted primarily of metabolic products of the parent compound. (Author abstract by permission)

**79-1279.** Murthy, N. B. K.; Kaufman, D. D.; Fries, G. F. (ARS, USDA, Beltsville, MD 20705) **Degradation of pentachlorophenol (PCP) in aerobic and anaerobic soil.** *J. Environ. Sci. Health B* 14(1): 1-14; 1979. (11 references)

An experiment was designed to study the degradation of the herbicide pentachlorophenol (PCP) under aerobic and anaerobic conditions. A manifold assembly system was used in which $^{14}C$-labeled PCP was incubated with nitrogen aerated, moist Hagerstown silty clay loam with or without added microcrystalline cellulose powder. GC and TLC were used to identify the volatilized products and to analyze soil extracts. In anaerobic soil in the presence of cellulose, PCP reduced soil respiration. No $^{14}C$-labeled $CO_2$ was detected, and only 0.5% of the added PCP was accounted for by volatilization losses. Pentachloroanisole was found to be present in both aerobic and anaerobic soil. 2,3,5,6- and 2,3,4,5-tetrachlorophenols and 2,3,6-trichlorophenol were also detected. A pathway for the degradation of PCP in soil was proposed.

**79-1280.** Ihnat, M.; Nelson, D. L. (Chem. & Biol. Res. Inst., Agric. Canada, Ottawa, Ontario, K1A 0C6, Canada) **Cyanide residue levels in extracted honey, comb honey, and wax cappings.** *J. Environ. Sci. Health B* 14(1): 39-51; 1979. (15 references)

In this investigation, honey bee colonies were treated with normal (8.5 g) and twice normal (17 g) doses of Cyanogas A (calcium cyanide) dust applied by means of a dust pump. Honey, comb honey, and wax cappings were collected 1 hr, 24 hr and 48 hr after treatment. In order to measure cyanide residue, cyanide was distilled off as HCN, and then determined by a pyridine-pyrazolone colorimetric procedure. With the normal dose, cyanide residues were 0.01, 0.01, and 0.04 μg/g with extracted honey, comb honey, and wax cappings, respectively. With the twice normal dose, the values were 0.04, 0.02, and 0.06 μg/g for extracted honey, comb honey, and wax cappings. Honey samples from beekeepers who used Cyanogas to destroy bees were found to have a median level of 0.31 μg/g, while commercial samples had a median level of 0.004 μg/g. The very low levels of cyanide found led to permanent registration of Cyanogas A dust for destroying bees after the honey crop is removed.

**79-1281.** Hashemy-Tonkabony, S. E.; Assadi-Langaroodi, F. (Res. Lab., Dep. Food Hyg., Univ. Tehran, Tehran, Iran) **Chlorinated pesticide residues in butter from the Tehran region.** *J. Food Prot.* 42(3): 202-203; 1979. (13 references)

During 1976-77 the residues of chlorinated pesticides were measured in 105 butter samples from the Tehran region of Iran. DDT was found in 93 samples. DDE and TDE were found in 100 samples. Dieldrin was detected in 73 samples,

while lindane was found in 100 of the samples tested. The mean level of lindane found was 0.11 ppm (range 0.041 to 0.024 ppm); DDT, 0.037 ppm (range 0.011 to 0.082 ppm); DDE, 0.053 ppm (range 0.019 to 0.45 ppm); and dieldrin, 0.015 ppm (range 0.001 to 0.09 ppm). The mean level of chlorinated pesticide residues found was lower than the recommended standards established by WHO for daily products (1.25 ppm for DDE, TDE, and DDT, singly and in combination, 0.15 ppm for dieldrin, and 0.2 ppm for lindane.) These small concentrations might be due to such factors as low use of land for grazing and high use of dehydrated feeds for dairy animals. The recent decrease in the use of chlorinated pesticides in Iran might also contribute to the low levels of these compounds in dairy products.

**79-1282.** Anonymous **High serum concentrations of DDT residues - Triana, Alabama.** *Morbidity & Mortality Weekly Report* 28(11): 123-124, 129; 1979. (4 references)

In December 1978 the Tennessee Valley Authority (TVA) reported that fish caught from a tributary of the Tennesses River in Triana, Alabama, were contaminated with DDT and related compounds. The local residents were tested for serum levels of DDT and its metabolites because fish make up a large part of the diet of the population of this area. Twelve life-long residents ranging in age from 43 to 83 yr had an average serum concentration of *p,p'*-DDE of 225 ppb. This figure excludes the value obtained from one member of the study whose serum level of DDE was 3,256 ppb, a concentration 4 times higher than any values previously reported. Women had a lower mean DDE level than the men did. No relationship was found between prior agricultural work and DDE levels. The most significant factor in relation to level of serum DDE was found to be the amount of fish consumed. Persons eating fish once or less/wk had significantly lower DDE concentrations in their serum than those eating fish 4 to 6 times/wk. The TVA tested pooled samples of 5 species of fish and found an average DDE concentration of 204 ppm. The levels of DDT compounds found in the Triana residents was comparable to levels found in heavily exposed industrial workers engaged in the manufacture of DDT. The contamination of the tributary was believed to be largely due to an inoperative DDT manufacturing facility located upstream of the town.

**79-1283.** Izawa, T.; Asaka, S. (Ageo Res. Lab., Agrochem. Div., Nippon Kayaku Co. Ltd. Ageo, Saitama, Japan) **[Residues of methoxyphenone in various soils and crops.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 4(1): 61-65; 1979. (12 references) (Japanese)

Residues of the herbicide, methoxyphenone (3,3'-dimethyl-4-methoxybenzophenone) and its major metabolite (3,3'-dimethyl-4-hydroxybenzophenone) in various soils and several crops were determined. Soil specimens were extracted with methanol and crop species were extracted with acetonitrile. After clean-up the extract was separated into methoxyphenone and its major metabolite and determined by gas chromatography. Recovery of methoxyphenone was high (82-95%) except from lettuce (74%). Recovery of the metabolite was slightly less (72-85%). According to the laboratory experiment, the presumed half-life of methoxyphenone was 23-30 days in upland soil and 7-10 days in soil in flooded paddy field. The formation of its major natural metabolite was 1% of reinforced methoxyphenone in upland soil but was 26-55% in soil in flooded paddy field. Residues of methoxyphenone in or on crops were less than the detection limit except in the carrot, with a residue level of 0.042 ppm.

**79-1284.** Abdulla, M.; Dencker, I.; Haglund, G.; Persson, K.; Noden, A.; Rosen, G. (Dep. Clin. Res., Univ. Lund Hosp., Lund, Sweden) **Pesticides.** *Scand. J. Gastroenterol. Suppl.* 14(S52): 217-222; 1979. (39 references)

Samples of daily human food were collected and examined for pesticide residues. A total of 107 samples were taken over a period of 2 yr. In the 30 samples from 1970, DDT concentrations exceeded the detection limit values in only five cases; lindane in only two cases. Dieldrin was detected in one case and aldrin was not detected in any. In the 77 samples, taken as a second series of test items in 1971, DDT was detected in 8 cases at a level of 0.03 ppm. Lindane levels were under 0.01 ppm and the aldrin, dieldrin, and $\alpha$-BHC concentrations were under the detection limit in all cases except one. Concentrations of chlorinated biphenyls and organophosphate pesticides were under the detection limits.

**79-1285.** LaFleur, K. S. (Dep. Agron. & Soils, Clemson Univ., Clemson, SC 29631) **Sorption of pesticides by model soils and agronomic soils: rates and equilibria.** *Soil Sci.* 127(2): 94-101; 1979. (24 references)

Sorption of the insecticides DDT, malathion, and carbaryl, and several herbicides by selected model soils, soil components, and agronomic soils has been assessed. Pesticide adsorption ratios (amount sorbed vs. amount applied) were not dependent on pesticide concentrations for inorganic substrates. In organic matter-containing substrates adsorption ratios decreased with increased pesticide concentrations. Pesticides sorption ratios by inorganic and organic matter were independent of time and increased with time, respectively. Sorption curves obtained for agronomic soils were similar to, or indistinguishable from, values of peat containing soil models. Calculations of sorption values in composite soil can be made from sorption values of its various components, including full share for the dominant component (peat), residual free pesticide for the intermediate (e.g. kaolinite) components, and full share for the least reactive (e.g. sand) component.

**79-1286.** Mestres, R.; Francois, Cl.; Chevallier, Ch.; Vigo, G. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France) **[Search for micropollutants in atmospheric dust samples taken in Languedoc.]** *Trav. Soc. Pharm. Montpellier* 38(3): 273-282; 1978. (6 references) (French)

A search for micropollutants confirmed the presence

of traces of chlorinated and phosphorous pesticides and of phtalates in atmospheric dust samples collected in 3 districts of Southern France from 1973 through 1975. The dust traps consisted of steel plaques coated at first with vaseline and later with silicon grease and exposed at 3 m and 1.5 m from the ground for 14 days. Extracts obtained from these plaques were analyzed by gas chromatography. The least commonly found pollutants included α-HCH (α-BHC), dicofol, diazinon, fenithrotion, malathion, methyl parathion, PCB and a phtalate (DIBP). The four most frequently detected were γ-HCH (lindane), (in 95% of the observations), parathion, dibutyl phtalate (DBP) and diethylhexyl phtalate (DEHP). The frequency of γ-HCH, more prevalent from January to August, seemed to be related to its use in agriculture. No valid correlations could be established between the fluctuations in amounts noted and meteorological factors. In 1976, a special search for hexachlorobenzene (HCB) yielded very few results. There was a total absence of residues of DDT or its metabolites. The discovery, by mass spectrometry, of the off-and-on presence of phtalates in rather high amounts for certain periods (up to 6500 μg for DEHP and 1000 μg for DBP) appeared to warrant further investigation.

**79-1287.** Scheybal, A.; Habrio, Th.; Konrad, H. (Inst. Milchforsch., DDR-14 Oranienburg, DDR) **Zum abbauverhalten von naled. - Untersuchungen mit Hilfe von $^{82}$Br-Naled [Degradation of naled. Investigations with $^{82}$Br-naled.]** *Z. Chem.* 18(11): 404-405; 1978. (7 references) (German)

The degradation of $^{82}$Br-labeled naled in water was studied in laboratory experiments. The degradation was also studied in the presence of glutathion. Dichloro bromo acetaldehyde and DDVP were identified mass spectrometrically as the primary metabolites. At pH 7.0, the concentration of naled decreased to less than 75% of the original level in 72 hr, but it decreased to about 50% in 24 hr at pH 8.0. The findings indicate that the degradation of naled is due to hydrolysis and reaction with natural thiol compounds to DDVP and bromide.

**79-1288.** Thielemann, H.; Grahneis, H. (Hyg. Inst. Martin Luther Univ., DDR-402 Halle (Saale), DDR) **Experimentelle Untersuchungen zur Frage der Kontamination von Fischen und Fischkonserven mit dem Pflanzenschutzmittel DDT. [Experimental studies on the contamination of fresh and canned fish with DDT.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 24(12): 935-936; 1978. (German)

One hundred and thirty-eight samples of fresh, smoked and canned fish were analyzed for DDT residue levels by TLC method. Contamination by DDT was detected in 75/138 samples, but the tolerance limit (1 ppm) was not exceeded in any of the samples. The DDT levels found in 6 perch averaged 0.02 ppm; the DDE levels, 0.09 ppm; and the BHC levels, 0.01 ppm. The relatively high incidence of contamination, observed during the 1975-1977 period, is attributed to accumulation in the trophic chain. DDT will be of lesser hygienic importance in the future, because its use has been restricted.

*See also* **79-1253** *and* **79-1351.**

**79-1289.** Shabtai, F.; Bichacho, S.; Halbrecht, I. (B. Gattegno Res. Inst. Hum. Reprod. & Fetal Dev., Hasharon Hosp., Petah-Tiqva, Israel) **Cytogenetic observations in infertile men working with insecticidal compounds.** *Acta Genet. Med. Gemellol.* 27:51-56; 1978. (24 references)

Studies on five men who had suffered from infertility presumably as a result of occupational exposure to organochlorine and organophosphorus pesticides are reported. All patients displayed increased chromosomal breakage with damages especially to the Y chromosome. These cytological abnormalities might explain their impaired spermatogenic functions. The correlations between the involvement of heterochromatic chromosomal variants and individual susceptibility to chemical toxins in relation to reproductive fitness are discussed. Abnormal reproductive hormone levels were also found in the five cases studied.

**79-1290.** Bernstein, J. E.; Lorincz, A. L. (Sect. Dermatol., Dep. Med., Univ. Chicago Hosp. & Clin., Chicago, IL) **Ethylene-induced exfoliative erythroderma.** *Arch Dermatol.* 115(3): 360-361; 1979. (8 references)

Exfoliative erythroderma, a serious dermatologic condition, caused by exposure to ehtylenediamine is described. Ethylenediamine, which is used as a dibasic stabilizer in many fungicides and insecticides, is also a component of the drug, aminophylline. A case is reported of a woman treated with aminophylline for a severe asthma attack. Generalized exfoliative erythroderma developed and was treated successfully. The possibility is presented that the woman had been sensitized to ethylenediamine prior to the attack through the use of waxes and wetting agents containing the compound.

**79-1291.** Vaziri, N. D.; Ness, R. L.; Fairshter, R. D.; Smith, W. R.; Rosen, S. M. (Div. Nephrol., Dep. Med., Univ. California, Irvine, CA) **Nephrotoxicity of paraquat in man.** *Arch. Int. Med.* 139(2): 172-174; 1979. (23 references)

Three patients were admitted to the hospital with paraquat poisoning (two suicidal and one accidental ingestion). Each case demonstrated acute renal failure. Attempts were made to reduce gastrointestinal absorption by gastric lavage, catharsis, and administration of a specific paraquat adsorbent, Fuller's Earth. The excretion of paraquat was increased by forced diuresis and hemodialysis. Hypoxic breathing mixtures were also administered in an attempt to modify the tissue effects of absorbed, nonexcreted paraquat. In two cases gradual improvement of creatinine clearance was noted and these patients lived for about three weeks after ingestion. In the third case the patient died before such improvement could occur. The findings in each of these cases of renal glucosuria, marked amino aciduria, and increased fractional excretion of phosphorus, sodium and uric acid are indicative of proximal tubular dysfunction and parallel observations made in experimental animals, though these findings have not been previously reported in man.

**79-1292.** Pont, A.; Rubino, J. M.; Bishop, D.; Peal, R. (Santa Clara Valley Med. Cent., San Jose, CA) **Diabetes mellitus and neuropathy following Vacor ingestion in man.** *Arch. Int. Med.* 139(2): 185-187; 1979. (19 references)

Two patients swallowed Vacor in suicidal attempts. Vacor, a rodenticide, contains *N*-3 pyridylmethyl-*N'*-*p*-nitrophenyl urea as its active ingredient. Both patients developed ketotic diabetes mellitus and severe autonomic and peripheral neuropathy. Each was treated wth niacinamide therapy. In one patient this treatment was instituted 9 hr after ingestion, and in the other, 14 hr after ingestion of the poison. In the first patient the original therapy had been niacin, which was changed to niacinamide. In neither case was this treatment able to prevent the occurrence of diabetes mellitus and neuropathy. While the efficacy of niacinamide therapy in such cases remains undetermined, it is suggested that the drug be available in emergency rooms as animal data strongly suggest a beneficial effect if therapy is begun within two hr of ingestion.

**79-1293.** Prescott, L. F.; Park, J.; Darrien, L. (Univ. Dep. Ther. & Clin. Pharmacol., Edinburgh, EH3 9YW, Scotland) **Treatment of severe 2,4-D and mecoprop intoxication with alkaline diuresis.** *Br. J. Clin. Pharmacol.* 7(2): 111-116; 1979. (20 references)

A 39-yr-old male was admitted to the hospital 2 hr following deliberate ingestion of a weedkiller containing 10% 2,4-D and 20% mecoprop (MCPP), He had drunk the contents of a lemonade bottle half-full of the mixture. Deep coma resulted along with pyrexia, hyperventilation, hypoxemia, myotonia, skeletal muscle damage, and electrocardiographic changes which were consistent with cardiomyopathy. Plasma concentrations of 2,4-D and mecoprop were 400 and 751 μg/ml, respectively upon admission. Supportive therapy over a 2 day period offered no signs of improvement. Alkaline diuresis increased renal clearance of 2,4-D and a rapid fall in plasma 2,4-D concentration was noted with clinical improvement. A similar, but less dramatic, change was noted in mecoprop elimination. The early use of forced alkaline diuresis is suggested in similar cases.

**79-1294.** Marubini, M. B. (Cent. Antiveleni, Osp. Maggiore Ca Granda, Milan, Italy) **Actualites therapeutiques en toxicologie clinique. [Current therapeutics in clinical toxicology.]** *Bruxelles Med.* 58(12): 621-636; 1978. (20 references) (French)

Available therapies for acute intoxications requiring urgent and intensive treatment are reviewed. The vital importance of symptomatic treatment (reanimation) is discussed, and the need to recognize that essential functions may be masked by typical signs of intoxication is considered. Seven different reactions of a specific antidote to a poison are noted. The first involves chelation of heavy metals in rare instances such as the treatment of cyanide poisoning with dicobaltic tetracemate. The second and third possibilities are the accelerated metabolic transformation of the poison into less le-

thal substances, and the slowdown of the product of more toxic metabolites. In thallium poisoning, Prussian blue is used to accelerate the elimination of the toxin. Other mechanisms are the competitive antagonism for specific receptors, or the blockage of receptors responsible for toxic effects such as the use of anticholinesterasics as poisons or antidotes. Atropine is used as a toxic agent blocking cholinergic receptors in cases of organophosphorus poisonings. Anticholinesterasics such as prostigmine or physiostigmine act as antidotes against atropine. The last action mechanism reviewed is the bypass of the poison's effect on the target organ (eg. curare against strychnine). Techniques for the artificial elimination of the poison from the body after absorption are discussed. Hemoperfusion, with adsorption of toxic substances over charcoal or resin, has been used with some success against intoxication by paraquat.

**79-1295.** Govaerts-Lepicard, M. (Author address not given) **Les facteurs de gravite dans les intoxications aigues. [Factors governing the severity of acute intoxications.]** *Bruxelles Med.* 58(12): 637-646; 1978. (5 references) (French)

On the basis of the statistics collected over 10 yr at the National Anti-Poison Center in Belgium, this article seeks to define the contributing factors in acute intoxications. These factors include the characteristics of the victim, the poison involved and the type of accident. Factors of extreme youth or advanced years play an important role. Infants are very sensitive to overdoses of medication such as nose drops and some antidiarrheics such as diphenoxylate or Loperamide. Older persons are prone to renal or cardio-vascular complications. The triggering circumstances and the reasons behind the accident also intervene in the seriousness of a case. Among children, the rate of hospitalization rises with age not only because of greater contmination but also because of suicide attempts. Tables giving the percent of poisonings which occur from such substances as drugs, pesticides, plants, and cosmetics are given. In the analysis of the product's role, the degree of toxicity, difficulty of treatment, and frequency of implication are considered in 2000 cases with 96 deaths or about 5% mortality. Chloroquine with its short latency period ending in cardiac arrest was judged to be the most dangerous substance, followed by ajmaline, also rapidly fatal, and colchicine the symptomatology of which is sometimes delayed.

**79-1296.** Wolfe, H. R.; Staiff, D. C.; Armstrong, J. F. (Health Effects Res. Lab., Field Studies Sect., US EPA, Wenatchee, WA) **Exposure of formulating plant workers to ethion and malathion.** *Buli. Environ. Contam. Toxicol.* 20(6): 778-781; 1978. (6 references)

The potential exposure of plant workers during production of 25% water-wettable powder ethion and 5% malathion dust was studied. Dermal contamination was measured by attaching layered-gauze absorbent pads to various parts of the worker's body, and respiratory exposure was estimated by using special filter pads on respirators. The pads were extracted with benzene in a Soxhlet apparatus, followed by electron-capture gas liquid chromatography to analyze pesticide content. Exposure to ethion was calculated to be 126 mg/hr dermally and 1.71 mg/hr by respiration. For malathion, dermal exposure was 150 mg/l and respiratory exposure 1.29 mg/hr. The results indicate that, while most workers are not exposed to hazardous pesticide levels, occasional high values were obtained, possibly due to carelessness or machinary malfunction.

**79-1297.** Murray, C. (Author address not given) **Chemical waste disposal a costly problem.** *Chem. Eng. News* 57(11): 12-16; 1979.

The EPA would like to implement a new chemical waste disposal program that would follow hazardous chemical wastes from the time of their production through their transport to their ultimate disposal site, and then oversee the monitoring of the disposal site for possible contamination of soil and groundwater for up to 20 yr. Many complaints about the costs of such an operaton are expressed, and industrial scientists and environmentalists give their views on the EPA's past and future plans for regulating the handling of chemical wastes. Hazardous chemical wastes present special problems of disposal, and a list of chemicals (including pesticides and some drugs) considered toxic by the EPA is given.

**79-1298.** Nater, J. P.; Terpstra, H.; Bleumink, E. (Dep. Dermatol., State Univ. Hosp., Groningen, The Netherlands) **Allergic contact sensitization to the fungicide maneb.** *Contact Derm.* 5(1): 24-26; 1979. (3 references)

A 29-yr-old draftsman reported exacerbations of eczema on his arms, the dorsa of his hands and fingers, and on his face, following spraying of plants in his workroom with maneb preparation. A 37-yr-old employee in the same office experienced watering eyes and a blocked nose for 2 yr. His symptoms disappeared on the weekends. A 51-yr-old woman contracted an acute papular and vesicular eczema on both the back and the palms of her hands after assisting her son in his flowershop. Each patient showed a positive allergic reaction to maneb in patch tests. In each case avoidance of the use of the fungicide led to complete recovery.

**79-1299.** Nater, J. P.; Grosfeld, J. C. M. (Dep. Dermatol., State Univ. Hosp., Groningen, The Netherlands) **Allergic content dermatitis from Betanal (phenmedipham).** *Contact Derm.* 5(1): 59-60; 1979.

A 51-yr-old farmer presented with a severe exacerbation of his photodermatitis in 1973 after a long history which suggested photosensitivity. The same patient appeared again in 1978. The patient had used Betanol (phenmedipham) for 8 to 9 yr without any apparent problem, and had used it also a few days before this last occurrence. Patch tests gave a reaction to Betanal which took 14 days to subside. A second farmer, aged 55 yr, presented in 1976 with a severe, spreading bullous dermatitis of both hands. He had sprayed his land a few days earlier with Betanal. Patch tests revealed a 3 plus positive reaction to Betanal diluted to a concentration of 2%

in water. This farmer had also used the herbicide for 8 to 9 yr prior to this time with no problem.

**79-1300.** Lovejoy, F. H. (Children's Hosp. Med. Cent., Boston, MA) **Priorities in poisoning.** *Emerg. Med.* 11(2): 265-267, 271-272, 274, 277; 1979.

General management practices in toxicological emergencies include identification of the poison, its doages, chronology, and symptomology. Viewed from a pharmacological standpoint, the absorption rate of the poison, its formulation, and its mode of action are most critical. An important criterion in the treatment of poisoning cases is whether the drug is handled by hepatic or renal metabolic mechanisms. Much more positive treatment can be affected if the drug is metabolized by the kidneys. Mechanical ways of removing drugs from the body include physical stimuli, lavage, and the use of ipecac. Ipecac syrup is effective, fast-acting, and can be kept on hand at all times. Antidotes for narcotic-induced poisoning include nalophine and levallorphan which reverse the effect of the narcotic at receptor sites in the brain. A complex therapy of Na nitrite and Na thiosulfate is required for cyanide poisoning. Atropine is a specific antagonist of cholinesterase-inhibiting pesticides, such as malathion, parathion, and Chlorthion. The most vital points with pesticide poisoning are the removal of the drug as completely as possible from the skin and the administration of enough to reverse its effects. The pediatric dose is 0.4 mg atropine sulfate/ml of iv solution administered every 2-5 min until the child is fully atropinized.

**79-1301.** Young, J. F.; Haley, T. J. (NCTR, Jefferson, AR 72079) **Simultaneous human pharmacokinetics of 2,4-dichlorophenoxy-acetic acid and 2-methoxy-3,6-dichlorobenzoic acid.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, pt. 1): 679; 1979.

A simultaneous pharmacokinetic study of two chemicals has been conducted on a clinically stabilized human who had intentionally ingested a herbicide mixture of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2-methoxy-3,6-dichlorobenzoic acid (dicamba). Blood and urine samples obtained during the acute phase of intoxication were modified for the pharmacokinetic analysis by a digital-analog hybrid computer. The best fitting model that utilized all the data was obtained with a two-compartment model for dicamba and a one-compartment model for 2,4-D with an additional interactive urinary excretion pathway. The volumes of distribution, rate constants, and half-life values were obtained by a statistical best fit of the data by the hybrid computer. The hybrid computer simulation allowed prediction of tissue levels not measured as well as blood and urine levels that would have occurred if the interaction between the chemicals had not existed. Such information can be useful in the clinical management of future intoxications from herbicide mixtures, bearing in mind the interaction between the two chemicals during their elimination. (Author abstract by permission)

**79-1302.** Daunderer, M. (Toxikol. Abt., Med. Klin. 2, Klin. Isar, Tech. Univ. Munich, D-8000 Munich 80, BRD) **Vergiftungstherapie - Antidote. Folge 2: Antidot - Indikationen - A. [Poisoning therapy - antidotes. Part 2: Antidote indications - A.]** *Fortschr. Med.* 96(26-27): 1359-1360; 1978. (German)

A list is given of various antidotes for the different types of poisoning for various toxic substances which are listed alphabetically. In this part of the series, those toxic compounds categorized under the letter A are outlined. Treatments for oral, percutaneous, or inhalation intoxications are listed for 109 compounds including aldicarb, alkylphosphate, ammonia gas, aprocarb (propoxur), arsenic trioxide, other arsenic compounds, atropine, azinphos-ethyl, and azinphos-methyl. The most common treatments recommended for pesticide intoxications were atropine, and dimercaprol. For non-pesticidal toxins, Dexa-spray (a cortisone drug) was the frequently recommended antidote.

**79-1303.** Daunderer, M. (Toxikol. Abt., Med. Klin 2, Klin, Isar, Tech. Univ. Munich, D-8000 Munich 80, BRD) **Vergiftungstherapie - Antidote. Folge 3: Antidot - Indikationen - B-E. [Poisoning therapy - antidotes. Part 3: Antidote indications- B-E.]** *Fortschr. Med.* 97(3): 100-102; 1979. (German)

A list is given of various antidotes for the different types of poisoning for various toxic substances which are listed alphabetically. In this part of the series, those toxic compounds categorized under the letters B-E are outlined. Treatments for oral, percutaneous, or inhalation intoxications are listed for 199 compounds including carbaryl, carbofuran, carbophenothion, cartap, chlorfenvinphos, chlorpropham, diquat, demeton, diazinon, dibrom (naled), 2,4-D, dichlorvos, dicrotophos, dimethoate, disulfoton, and epichlorhydrin. The most common treatments recommended for pesticide intoxicatons were atropine and obidoxime. For non-pesticidal toxins, dexa-spray (a cortisone drug) was the frequently recommended antidote.

**79-1304.** Daunderer, M. (Toxikol. Abt., Med. Klin. 2, Klin. Isar, Tech. Univ. Munich, D-8000 Munich 80, BRD) **Vergiftungstherapie - Antidote. Folge 4: Antidot- Indikationen - F-K. [Poisoning therapy - antidotes. Part 4: Antidote indications - F-K.]** *Fortschr. Med* 97(4): 139-140; 1979. (German)

A list is given of various antidotes for the different types of poisoning for various toxic substances which are listed alphabetically. In this part of the series, those toxic compounds categorized under the letters F-K are outlined. Treatments for oral, percutaneous, or inhalation intoxications are listed for 122 compounds including fenitrothion, fensulfothion, fenthion, iodofenphos, and isoprocarb. The most common treatments recommended for pesticide intoxications were atropine and obidoxime. For non-pesticidal toxins, Dexaspray (a cortisone drug) was the most frequently recommended antidote.

**79-1305.** Daunderer, M. (Toxikol. Abt., Med. Klin. 2, Tech. Univ. Munich, D-8000 Munich 80, BRD) **Vergiftungstherapie - Antidote. Folge 5: Antidot - Indikationen - L-Z. [Poisoning therapy - antidotes. Part 5: Antidote indications - L-Z.]** *Fortschr. Med.* 97(5): 198-203; 1979. (German)

A list is given of various antidotes for the different types of poisoning for various toxic substances which are listed alphabetically. In this part of the series, those toxic compounds categorized under the letters L-Z are outlined. Treatments for oral, percutaneous, or inhalation intoxications are listed for approximately 409 compounds indicating malathion, meobal, methidathion, methomyl, mevinphos, mexacarbate, mobam, molinate, monocrotophos, morfamquat, DDT, naphthalene, oxamyl, paraquat, methyl parathion, perbulate, phenmedipham, phorate, phosphamidon, pirimicarb, propham, propoxur, quintozene, sulfotepp, tetrachlorvinfos, thallium, and thiofanox. The most common treatments recommended for pesticide intoxications were atropine and obidoxime. For non-pesticidal toxins, Dexa-spray (a cortisone drug) was the most frequently recommended antidote.

**79-1306.** Daunderer, M. (Toxikol. Abt., Med. Klin. 2, Klin. Isar, Tech. Univ., Munich, D-8000 Munich 80, BRD) **Magenspuelung bei Vergiftungen. [Gastric lavage in poisoning cases.]** *Fortschr. Med.* 97(5): 204-209; 1979. (German)

The principles and applications of gastric lavage in the treatment of poisoning are discussed with particular reference to experiences gained at the University of Munich. Gastric lavage was performed in 35% of the 1111 patients evaluated at the Department of Toxicology in 1975. No fatalities, gastric perforations or other complications leading to permanent injury were noted as a result of this practice since 1963. In 1976, 12 (70%) of the patients conveyed to the clinic by helicopter had not yet received gastric labage at the time the arrangements for emergency transport were made. In 3 of the 8 fatalities among this group, the delay in performing gastric lavage was adjudged to be at least partially responsible for the deaths. Gastric lavage should be performed on even unconscious patients in whom poisoning is suspected. Collection of lavage effluent may aid in diagnosis. The importance of performing gastric lavage even if some time has elapsed after poisoning is illustrated by a double suicide with parathion. Intestinal paralysis following ingestion of hypnotics, opiates and thallium may necessitate repeated lavage. There are no absolute contraindications against gastric lavage. but certain chemical groups and circulatory conditions present relative contraindications. Failure to perform gastric lavage because the seriousness of the poisoning has been underestimated can be considered negligent.

**79-1307.** Belonozhko, G. A.; Zor'eva, T. D. (All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic. Polymers & Plast. Mat., Kiev, USSR) **Gigienicheskie aspekty primeneniya pestitsidov v zashchishchennom grunte. [Hygienic aspects of the use of pesticides in greenhouses.]** *Gig. Sanit.* 44(1): 74-76; 1979. (11 references) (Russian)

The genral hygienic problems of the use of pesticides in greenhouses are discussed. As a result of the inherently high temperature and humidity, the degradation of pesticides is accelerated in greenhouses. This in turn, requires the use of increased doses or more frequent treatment, which is ultimately likely to result in increased residue levels in the produce. On the other hand, some pesticides are more toxic under the conditions of high temperature and humidity which also increase the skin resorption of the pesticides due to sweating. The hygienic standards for greenhouse workers should be elaborated on the basis of inhalative and percutaneous uptake.

**79-1308.** Soliman, S. A.; El-Sebae, A. H.; El-Fiki, S. (Plant Prot. Dep., Coll. Agric., Alexandria Univ., Alexandria, Egypt) **Occupational effect of phosfolan insecticide on spraymen during field exposure.** *J. Environ Sci Health B* 14(1): 27-37; 1979. (24 references)

A study was designed to determine the health hazards of exposure to phosfolan during field spraying. Exposure pads made of cellulose were attached to highly exposed workers (mixers and applicators) and less exposed workers (supervisors and mechanics). The pads were extracted with chlorform and phosfolan levels were determined. Determination of cholinesterase (AChE) activity in the red blood cells of workers at various intervals after exposure was made. The maximum exposure of the mixer was 10 to 12 times that of the assistant. In the highly exposed group, there was 31-44% inhibition of RBC AChE. In the less exposed group, inhibition ranged from 14-27%. While half of the inhibited activity recovered after 48 hr, 3-4 wk was required for complete recovery.

**79-1309.** Wong, O.; Utidjian, M. D.; Karten, V. S. (Tabershaw Occup. Med. Assoc., Rockville, MD 20852) **Retrospective evaluation of reproductive performance of workers exposed to ethylene dibromide (EDB).** *J. Occup. Med.* 21(2): 98-102; 1979. (9 references)

The possible effects of ethylene dibromide (EDB) on fertility were studied by reviewing the reproductive performance of male workers occuptionally exposed to this chemical over a number of years. Records of the number of live, legitimate, natural children born to the men's wives were compared to the National Center for Health Statistics tables for the number of expected births for female populations matched in age, parity, race and calendar year. The number of observed births were expressed as a percentage of expected births to measure employee reproductive performance. Of the four factories studied, only one showed a significant decrease ($p < 0.05$) in male worker fertility.

**79-1310.** Whorton, D.; Milby, T. H.; Krauss, R. M.; Stubbs, H. A. (Labor Occup. Health Program, Univ. California, Berkeley, CA) **Testicular function in DBCP exposed pesticide workers.** *J. Occup. Med.* 21(3): 161-166; 1979. (10 references)

A clinico-epidemiological study among male pesti-

cide workers in California was conducted. Of 142 non-vasectomized men providing semen samples, 107 had been exposed to 1,2-dibromo- 3-chloropropane (DBCP, dibromo chloropropane), while 35 were not exposed. Of the exposed workers 13.1% were azoospermic, 16.8% were severely oligospermic, and 15.8% were mildly oligospermic. Of the controls 2.9% were azoospermic, 5.7% mildly oligospermic, and none were severely oligospermic. Biopsies revealed the seminiferous tubules to be the site of damage.

**79-1311.** Popendorf, W. J.; Spear, R. C.; Leffingwell, J. T.; Yager, J.; Kahn, E. (Dep. Biomed. & Environ. Health Sci., Sch. Public Health, Univ. California, Berkeley, CA) **Harvester exposure to Zolone (phosalone) residues in peach orchards.** *J. Occup. Med.* 21(3): 189-194; 1979. (17 references)

The experimental design of the study involved exposing harvesters of cling peaches to foliar residues of 25% WP Zolone (phosalone) at decreasing re-entry intervals on a weekly basis, until a predetermined average of cholinesterase inhibition was observed. Dermal doses to pickers were estimated using 4 x 4" 16-ply surgical gauze pads, while respiratory doses were determined with aerosol filters. Approximatley 98-99% of the total calculated pesticide doses were attributable to dermal rather than respiratory exposure. Worker response to pesticide exposure was measured by cholinesterase activity. Despite estimated dose rates of up to 14 mg/hr, the RBC ChE activity was only slightly inhibited (4%).

**79-1312.** Anonymous *J. Air Pollut. Control Assoc.* 29(3): 265; 1979.

An experimental disposal system for pesticide wastes is being carried out by the EPA in conjunction with the Iowa Agriculture and Home Economics Experiment Station. The system involves dumping the wastes into in-ground pits with 113.4 1 capacity to store the pesticides until they have been broken down or evaporated. Larger pits, filled with gravel and soil, are also being tested for the disposal of pesticide wastes. The pits are lined with concrete and are periodically monitored by undergound piping to ensure that there is no leakage of harmful substances into the outside environment. Attempts will also be made to study the surrounding air to see if vaporization could cause harmful levels of pesticides, especially during the hot summer months. So far results with the pits have been favorable for safe disposal of insecticides, fungicides and herbicides at the research sites. It is suggested that this type of system could be adapted for pesticide disposal for commercial applicator operations.

**79-1313.** Hogstedt, C.; Malmqvist, N.; Wadman, B. (Dep. Occup. Med., Reg. Hosp., Orebro, Sweden) **Leukemia in workers exposed to ethylene oxide.** *J. Am. Med. Assoc.* 241(11): 1132-1133; 1979. (14 references)

Case reports of three workers who developed leukemia following occuptional exposure to ethylene oxide are described. Ethylene oxide is a gaseous sterilant used extensively for sterilization of hospital equipment as well as a fungicide/fumigant. The 8-hr time-weighted average exposure in this factory was calculated to be 20 ± 10 ppm. Since the expected cumulative incidence of leukemia for that group was calculated at 0.2 cases, recommendations for re-consideration of threshold limit values for ethylene oxide are given.

**79-1314.** Roberts, D. V. (Dep. Physiol., Univ. Liverpool, Liverpool L69 3BX, England) **Theoretical and practical consequences of the use of organophosphorus compounds in industry.** *J. Soc. Occup. Med.* 29(1): 15-19; 1979. (8 references)

The use of organophosphorus compounds in industry necessitates constant monitoring of their effects on workers. The chemical structure and biological action of organophosphorus compounds both *in vitro* and *in vivo* should be thoroughly investigated to devise methods for measuring the effects of the compounds on enzyme activity. Another biological action of these compounds, not related to cholinesterase, in the inhibition of the neurotoxic esterases by such compounds as TOPC (tri-*o*- cresyl phosphate). Organophosphorus compounds have also been found to effect the aminergic synapses, as seen in the inhibition of dopamine levels upon the dosing of rats with mipafox and leptophos. The disadvantages of using only blood cholinesterase monitoring systems for measuring exposure to organophosphorus compounds are listed. Electromyographic monitoring of nerve and muscle functions may prove to be a more reliable indicator of possible toxicity results from exposure to these types of chemicals.

**79-1315.** Walker, A. E. ; Martin, J. V. (Dep. Dermatol. & Chem. Pathol., Royal Hosp., Chesterfield S41 7SP, England) **Lipid profiles in dioxin-exposed workers.** *Lancet* 1(81139): 446-447; 1979. (3 references)

The γ-glutamyl transpeptidase (GGT), triglyceride, cholesterol, and high-density lipoprotein (HDL) levels of eight men who were occupationally exposed to TCDD (a by-product of 2,4,5-T synthesis) were measured. Some of the patients showed signs of ischemic vascular disease, five had elevated triglycerides, and GGT levels, and three had normal triglyceride and GGT levels. The HDL levels in all of the men were below the method mean, while total cholesterol was above the method mean. Total HDL-cholesterol ratios were correlated with a higher than average risk for ischemic vascular disease. These clinical symptoms have been observed previously in TCDD exposed subjects. The relation of increased GGT activity with abnormal lipid levels is most likely due to enzyme induction for which TCDD or other enzyme inducers could be responsible.

**79-1316.** Simpson, G. R.; Higgins, V.; Chapman, J.; Bermingham, S. (Div. Occup. Health & Radiat. Control, Health Comm. New South Wales, Lidcombe 2141, New South Wales, Australia) **Exposure of council and forestry workers to 2,4,5-T.** *Med. J. Aust.* 2(11): 536-537; 1979. (536 references)

Australian council and forestry workers exposed to the plant poison, 2,4,5-T, were monitored for two yr for urinary excretion levels of the pesticide. The three methods used in 2,4,5-T application involved direct application, engine-powered knapsack mister, and spray/hand guns. Of these, the spray and mister methods were the ones most likely to cause high exposure to the pesticide due to drifting of spray mists and leaky spray gun handles. After the use of protective clothing and methods for prevention of inhalation were adopted, the urinary levels of 2,4,5-T were dramatically reduced.

**79-1317.** Chao, L. W. (Off. Occup. Safety & Health Statistics, Bur. Labor Statistics, Washington, DC) **Occupational skin disease continues to plague industry.** *Mon. Labor Rev.* 102(2): 17-22; 1979.

An extensive review is given of the incidence of dermal occupational diseases that occur in various fields of work. The industry most affected by skin related diseases is the leather-working trade, followed closely by agriculture, which relies heavily on the use of farm chemicals and pesticides. Percentages for work-related dermal disorders, as well as the number of work days lost *per anum* are given in tabular form for the period from 1972 to 1976. Relative risk rates also show the agricultural industry to be high on the list for the contraction of skin disorders. An in depth explanation of dermatosis is given which shows that the malady is usually caused by exposure to chemical agents. Charts which show the areas of the body most often affected by various chemical inducers of dermal disorders are also included. Although most occupationally-related skin diseases are relatively mild and curable, there are still some cases that result in chronic ailments, permanent disability, or even death.

**79-1318.** Anonymous **Suspected carbamate intoxications-Nebraska.** *Morbidity & Mortality Weekly Report* 28(12): 133-134; 1979. (3 references)

Two separate incidents of food contamination by a carbamate pesticide in Nebraska are reported. In April, 1977, nine residents of Kimball complained of acute illness after eating hydroponic cucumbers. Diarrhea, nausea, vomitting, excessive perspiration, blurred vision, abdominal pains, temporary paralysis of the extremities, dyspnea, muscle fasciculation, and headache were some of the symptoms associated with the poisoning. Tests of the contaminated vegetables showed that the toxin was a carbamate insecticide but lack of standard compounds prevented further identification. In July, 1978 five residents of Scottsbluff, Nebraska (a town about 45 mi north of Kimball) acquired similar symptoms after eating the same variety of hydroponic cucumber. In both incidences the patients recovered completely after 1-3 days. In the 1978 incident the contaminant was found to be the carbamate insecticide aldecarb which was found in the local greenhouse in a nutrient solution that was used to nourish the vegetables. The quick recovery of the patients was probably due to the failure of the carbamates to irreversibly phosphorylate the acetylcholinesterase of the tissues as the organophosphate pesticides do, so that depressed plasma and red blood cell cholinesterase may revert to normal within a few hr after exposure to a carbamate pesticide.

**79-1319.** Inoue, T.; Horiue, T.; Akiyama, K.; Uehara, M.; Kuroda, M. (Sch. Int. Med. 2, Fac. Med., Kanazawa Univ., Kanazawa, Ishikawa, Japan) **[An experience on treatment with hemoperfusion in intoxication due to thiometon.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Int. Med.)* 68(2): 202; 1979. (Japanese)

A case of a 38-yr-old male who swallowed thiometon for suicide is presented. His past history included hypertension and subchronic glomerulonephrosis. He was discovered 24 hr after ingestion and was hospitalized. The major symptoms upon admission were pre-coma, spastic paralysis, logopathia and delayed light reflex. Results of examination showed positive proteinuria, urine containing RBC and WBC, slight increases of GOT, GPT, γ-GTP and CPK, and reduced cholinesterase activity of 0.1 IU/ml. He was treated for 3 days with hemoperfusion using hydron-coated beads. PAM (pralidoxime) and atropine sulfate were also administered. Symptoms were improved after one week and the cholinesterase activity was restored to normal after 2 wk. Except for a slight reduction of RBC and platelets, no side effect was observed during hemoperfusion.

**79-1320.** Hayakawa, Y.; Kikuoka, M.; Nakamura, T.; Fujiwara, Y.; Ueda, S.; Uchiyama, T.; Okayasu, D.; Amaki, T.; Ariga, H.; Sakurai, I. (Sch. Int. Med. 1, Fac. Med., Nippon Univ., Tokyo, Japan) **[An autopsy case from intoxication due to paraquat.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Int. Med.)* 68(3): 313; 1979. (Japanese)

A 29-yr-old male swallowed 50 ml of 24% paraquat dichloride in a suicide attempt and was later hospitalized. Upon admission he had oliguria, hemorrhage in the mucosa of the oral cavity, a husky voice, jaundice and dyspnea with abnormalities in the liver and kidney functions. Chest roentgenography confirmed interstitial pneumonia. Diuretics and steroids were administered and peritoneal lavage was performed. Paraquat was excreted in the urine at levels three times above the concentration found in the blood. Paraquat levels in the gastric lavage were 16.6% of the blood concentration. The patient died 15 days after ingestion. Autopsy results showed a slight fibrilation of the lungs, swelling of the kidney and acute necrosis of the kidney tubules. The liver was unremarkable. The importance of forced diuresis in early stages of this kind of intoxication is stressed.

**79-1321.** Sygit, M. (Author address not given) **Niektore aspekty ochrony zdrowia i zycia pracownikow rolnictwa. [Certain aspects of protecting the health and the life of agricultural workers.]** *Ochr. Pr.* 32(12): 7, 13; 1978. (6 references) (Polish)

The author briefly discusses the toxic effects of small amounts of pesticides on humans due to biomagnification. Since the use of pesticides is inevitable in modern agricuture,

the importance of prophylaxis is emphasized. Suggested methods for safety are regular periodical medica examinations, good hygienic practice and the use of protective clothing when working with pesticides. Some legal aspects of pesticide use are also discussed.

**79-1322.** Anonymous **National pesticide poison information center.** *Pediatrics* 63(3): 379; 1979.

The National pesticide telecommunications network announces the phone numbers for 24-hr medical consultation services for management of pesticide poisonings. The toll free number is (800) 845-7633 (in South Carolina, (800) 922-0193). This service is provided by the South Carolina Pesticide Epidemiological Studies Center and the Drug and Poison Information Center of the Medical University of South Carolina, Charleston, SC 29403.

**79-1323.** Kalas, D. (Div. Dis. & Occup. Health, Trutnov, Czechoslovakia) **Lehka hromadna inhalacni otrava Metathionem E-50 pri leteckem postriku. [Light group poisoning by metathion E-50 inhalation when spraying by means of aircraft.]** *Prac. Lek.* 30(4): 145-147; 1978. (7 references) (Czech)

The accidental acute intoxication of 25 workers with Metathion E-50 containing 50% fenitrothion is described. During spraying of a field crop from an aircraft a strong wind blew the insecticide 500 yards from the field. Typical symptoms of acute poisoning with organophosphorus compounds appeared in the stricken individuals 2.5-6 hrs following inhalation. The clinical picture was that of the nicotine and muscarine syndrome with the involvement of the upper respiratory tract and the laboratory finding of a 48% decrease of cholinesterasic activity in the blood. Blood pressure dropped in 26% of the afflicted workers by more than 20 mm Hg and 18% exhibited a slowdown of the pulse rate by 10 beats. Symptomatic therapy with atropine was administered for 3 days until the symptoms disappeared.

**79-1324.** Smith, J. (Author address not given) **EPA halts most use of herbicide 2,4,5-T.** *Science* 203(4385): 1090-1091; 1979. (1 reference)

Due to reports of 13 miscarriages among 8 women of Alsea, Oregon, the EPA has stopped spraying programs involving the herbicides 2,4,5-T and silvex in this area. The Dow Chemical Company was very unhappy with the EPA's decision to stop the use of the herbicides without conclusive evidence that the compounds cause detrimental effects to humans. Investigations so far have failed to show that residues of TCDD, a contaminant often found in these herbicides, is present in the tissues of the women who suffered miscarriages. The EPA is now beginning to analyze samples of soil, water, and animal tissue and human milk samples from Alsea for residues of TCDD. Should such residues be found in even minute amounts, the EPA feels it will not have any difficulty in defending the ban on widespread use of these herbicides, which have already proved teratogenic in laboratory animals.

**79-1325.** Makarenko, T. I. (Dep. Occup. Pathol., Res. Inst. Vocat. Hyg. & Occup. Dis., Kiev, USSR) **Sostoianie organa zreniia u poperatorov cvinovodcheskogo kompleksa. [The vision of the workers of a pig rearing facility.]** *Vrach. Delo* (11): 124-127; 1978. (13 references) (Russian)

Various toxicants such as feed concentrate components (antibiotics, hormones, and vitamins) as well as fungi, microorganisms and pesticides may cause allergenic or irritation effects. Temperature extremes and ammonia may intensify this reaction. The effect of these toxicants on the vision of 150 workers at a large pig-breeding farm was studied. The group was comprised of 56 men and 94 women, aged 19 to 38 yr. The average duration of exposure was 5 yr. The incidence of refraction anomalies detected was 26.7% (compared to 27.0% in a control group). Blepharoconjuctivitis and chronic conjuctivitis were almost twice as frequent in workers (17.3%, vs. 6.9% in controls). One third of the workers complained of hyperemia of the conjuctiva.

**79-1326.** Soboleva, L. P. (Clin. Dep., All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polymers and Plastics, Kiev, USSR) **Izmenenie uprugo-viazkikh svoistv arterial'nykh sosudov u kontaktiruiushchikh s tsinebom. [Changes in the elastic-viscous properties of the arterial vessels in persons who had exposure to zineb.]** *Vrach. Delo* (11): 127-129; 1978. (Russian)

A sphygmographic method was employed for evaluation of elastic-viscous properties of the vessels in persons who had an occupational exposure to the carbamate fungicide zineb. Of the 103 people examined 45 were men and 58 were women; aged 24 to 50 yr. The duration of exposure ranged from < 2 yr in 26 workers to 2-4 yr in 77. Exposure to zineb resulted in a decrease of the elastic-viscous properties of both elastic vessels (6.07 m/sec, compared with 7.54 m/sec in a control group) and muscular vessels (5.82 m/sec, vs. 8.08 m/sec).

**79-1327.** Witt, E. (Rue Groeselenberg 212, B-1180 Brussels, Belgium) **Besserer Schutz vor gefahrlichen Schadlingsbekampfungsmitteln. [Better protection against hazardous pesticides.]** *Zentralbl. Arbeitsmed. Arbeitsschutz Prophyl.* 29(1): 17-18; 1979. (1 reference) (German)

The Council of the European Communities has adopted a directive on the toxicological classification, packaging and labeling of hazardous pesticides. These directives are obligatory for the member countries, who are obliged to modify their regulations accordingly. Specific safety rules and preventive measures shall be printed on the packaging, along with the name of the toxic components.

*See also* 79-1252, 79-1254, 79-1256, 79-1260, 79-1277, 79-1282, 79-1333 *and* 79-1334.

**79-1328.** Schmidt, K.; Michel, H. J.; Frank, R.; Barth, A. (VEB Chemiewerk Coswig, DDR-4522 Coswig, DDR) **Die Verwendung neuartiger biologischer Parameter in der quantitativen Struktur-Wirkungs-Analyse: Hemmung der Acetylcholinesterase durch Carbamate und Hemmung des Keimwurzelwachstums von *Brassica napus* durch Piperidine acetanilide. [Use of novel biological parameters in quantitative structure-effect analysis: inhibition of acetylcholinesterase by carbamate and inhibition of the radical growth of *Brassica napus* by piperdino acetanilides.]** *Abh. Akad. Wiss. DDR* (2N): 417-420; 1978. (1 reference) (German)

The suitability of the new biological parameter K (binding constant), ψ (intrinsic activity of the substrate-receptor complex), and W*St* (standardized effect intensity) according to Barth und Franke for quantitative structure-effect analyses was studied with respect to the inhibition of acetylcholinestrase by carbamates, and of radicle growth of *Brassica napus* by piperidino acetanilides. The inhibiting effect of carbamates was found to increase with increasing hydrophobicity of the aliphatic group. All compounds with aliphatic substituents in the ortho position showed non-competitive inhibition, but competitive inhibition of acetylcholinesterase was observed in cases of meta- and para-substituents on the aromatic ring. With respect to the inhibition of the radicle growth, linear regression equations were obtained for pI50, log W*St* and log K in the case of meta- and para-substituted compounds.

**79-1329.** Bajgar, J.; Fusek, J.; Patocka, J.; Hrdina, V. (Purkyne Med. Res. Inst., 50260 Hradec Kralove, Czechoslovakia) **Detoxication of phosphonothioates and phosphonofluoridates in the rat.** *Acta Biol. Med. Ger.* 37(8): 1261-1265; 1978. (11 references)

Female Wistar rats were given im doses of 2 x LD50 of *O*-isopropylmethyl phosphonofluoridate (IMPF) and *O*-ethyl- *S*-(2-dimethyl aminoethyl) methyl- phosphonothioate and the activity of blood acetylcholinesterase (AChE) was continually monitored in an automatic colorimeter Auto Analyer. The activity of this enzyme decreased rapidly from the time of injection of the two organophosphates. When blood flow in the leg muscles was stopped by application of pressure and reopened by relaxation at various time intervals, AChE activity was either unaffected (detoxication present) or decreased (detoxication absent). Detoxication of IMPF did not occur in the rats, whereas the detoxication of the phosphonothioate took place *in vivo*. In contrast, the AChE-inhibiting ability of IMPF was eliminated after im injection and 20 min of compression. The phosphonothioate remained stable in terms of its acetylcholinesterase inhibiting ability. These effects may be caused by the hydrolysis of IMPF by the phosphoryl phosphatases ("sarinases") which have been reported to be present in the rat plasma.

**79-1330.** US Dep. HEW, NCI, NIH, Bethesda, MD **Report on carcinogenesis bioassay of 1,2-dibromoethane (EDB).** *Am. Ind. Hyg. Assoc. J.* 40(2): A31, A33-A35; 1979.

Carcinogenesis bioassays of 1,2-dibromoethane (EDB), a gasoline additive and a soil and grain fumigant, were carried out on Osborne-Mendel rats and B6C3Fl mice. Dosages in the rats ranged from 37-41 mg/kg, while dosages in the mice were 62 and 107 mg/kg. Administration was by stomach tube. Squamous cell carcinomas of the forestomach occurred in rats and mice of both sexes. Liver cancer occurred in female rats, hemangiosarcoma in male rats, and lung cancer in male and female mice.

**79-1331.** Touitou, Y.; Bogdan, A.; Luton, J. P. (Biochem. Dep., Fac. Med. Pitie- Salpetriere, F-75634 Paris, France) **Changes in corticosteroid synthesis of the human adrenal cortex *in vitro*, induced by treatment with *o,p'*-DDD for Cushing's syndrome: evidence for the sites of action of the drug.** *J. Steroid Biochem.* 9(12): 1217-1224; 1978. (29 references)

Human adrenals were removed from patients with Cushing's syndrome either treated or not treated with *o,p'* DDD (TDE). A significant decrease was noted in the synthesis of cortisol, corticosterone, 18-hydroxycorticosterone, and aldosterone in the adrenals of treated patients. These studies indicate the inhibitory effect of *o,p'*-DDD on 11-hydroxylase and 18-hydroxylase activities in human adrenals of treated subjects. Addition of *o,p'*-DDD, *o,p'*-DDE, *p,p'*-DDMU and *p,p'*-DDOH to incubation media did not effect steroid synthesis *in vitro*.

**79-1332.** Eroschenko, V. P. (Dep. Biol. Sci., Univ. Idaho, Moscow, ID) **Ultrastructural changes in the cells of magnum and shell gland of Japanese quail oviduct after treatment with estradiol 17β and estrogenic insecticide Kepone.** *Anat. Res.* 193(3): 532; 1979.

Four-wk-old female Japanese quail were injected daily by 40 μg estradiol 17β for 26 days or were fed 10, 40, 80, or 160 ppm Kepone (chlordecone) for the same length of time. The ultrastructural changes in the oviducts of the birds were then studied. Kepone displayed a dose-response effect in enhancing the development of the oviduct that increased with increasing dosages. Both Kepone and estradiol 17β produced marked cellular proliferation and tubular gland formation in the entire oviduct. profuse, tall cilia were observed over the surface epithelium and numerous mitochondria, developed endoplasmic reticulum, and Golgi and secretory granules were found in the tubular gland cells. All concentrations of Kepone produced structural abnormalities in the oviduct cells. The observed effects of Kepone on the mitochondria could be responsible for egg malformities affecting the shell, albumin synthesis, and pigmentation. A decrease in secretory granules in different cells may be an indication of altered cell function as a result of treatment of the quail with Kepone. [At the 92nd Mtg. of the Am. Assoc. of Anatomists]

**79-1333.** Crow, K. D. (Princess Margaret Hosp., Swindon, England) **Chloracne - an up to date assessment.** *Ann. Occup. Hyg.* 21(3): 297-298; 1978. (4 references)

Chloracne, a generally symptomless disease, may be caused by skin contact with, or ingestion or inhalation of chlornaphthalenes, chlorobiphenyls, chlorodibenzodioxins, chlordibenzofurans, and chloroazo- and chlorozoxy-benzenes. The lesions caused by the disease may clear in a few months or persist for as long as 15 yr. The dose needed to produce chloracne is very low in comparison with the amount needed to produce systemic poisoning from one of the chloracneigens. most of these compounds are formed as contaminants during the manufacture of other organochlorines. Investigation for toxic effects of the chloracneigens include carcinogenicity tests using 2,3,7,8-TCDD in rats. Knowledge of the effects of chloracneigens in humans is limited to observed effects of cases of poisoning of industrial workers exposed to 2,3,7,8-TCDD, of a Japanese population that ingested a cooking oil contaminated with tetrachlorobiphenyl chlorodibenzofuran, and a few isolated cases of chloracne, liver damage, weight loss, disturbance of the peripheral and central nervous systems, fetotoxicity, and porphyria. The toxicity of these compounds seems to be dependent upon the degree of chlorination, and the position of the halogens on the molecules. Difficulty arises in determining the exact positions of chemical groups because of the lack of accurately synthesized standard compounds. Measurement of enzyme induction offers a better estimate of the toxicity of the chloracneigens as many animal tissues contain drug metabolizing enzymes which may be extracted for *in vitro* testing. Aryl hydrocarbon hydroxylase has been found to be an accurate and sensitive indicator for poisoning by chloracneigens. The degree of induction of this enzyme has been found to correlate well with the relative degree of toxicity of the toxins tested. The stimulation of δ-aminolevulinic acid synthetase by 2,3,7,8-TCDD is implicated as the cause of porphyria in man.

**79-1334.** Dressel, T. D.; Goodale, R. L.; Arneson, M. A.; Borner, J. W. (Dep. Gen. Surg., Univ. Minnesota, Minneapolis, MN) **Pancreatitis as a complication of anticholinesterase insecticide intoxication.** *Ann. Surg.* 189(2): 199-204; 1979. (10 references)

A brief report is given of a woman who suffered severe pancreatitis and a pseudocyst following accidental ingestion of an anticholinesterase insecticide. To study the mechanism of anticholinesterase poisoning, the pancreatic ducts of dogs were perfused, and intraductal pressures were measured before and after the animals were dosed with *O,O*-diethyl-*O*-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate. This cholinesterase inhibitor (at 25 mg/kg) caused a significant increase in mean intraductal pressure from 12 ± 2.4 to 27.9 ± 5.8 cm saline. In another group of dogs, pancreatic secretory rates were determined. An increase in the secretin stimulated flow rate from 0.13 to 0.56 ml/min was observed with the administration of anticholinesterase (75 mg/kg) in combination with secretin infusion. These pressure and secretory rate increases were eliminated by a 75 μg/kg dose of atropine. In a third group of dogs, acute pancreatic interstitial edema, acinar cell vacuolization, hyperamylasemia, and hyperlipasemia occurred after the administration of a cholinesterase inhibitor (75 mg/kg) and secretin infusion (2 U/kg/hr). These findings suggest that the pancreatitis which may occur as a complication of anticholinesterase insecticide intoxication results from the hypersecretion and pharmacologic ductal obstruction.

**79-1335.** Mercier, M.; Gilbert, P.; Roberfroid, M.; Poncelet, F. (Lab. Biotoxicol., Sch. Pharm. Univ. Louvain, B-1200 Bruxelles, Belgium) **Mutagenic study of chlorinated derivatives of azobenzene.** *Arch. Int. Physiol. Biochim.* 86(4): 950-951; 1978. (4 references)

TCAB (3,4,3′,4′-tetrachloro azobenzene), DCA (3,4-dichloroaniline), and DCNB (3,4-dichloro nitrobenzene and TCDD were compared in regard to their mutagenicity using the Ames *Salmonella typhimurium* bacterial assays and the bacterial fluctuation test of Green *et al.* TCAB gave a positive but not significant mutagenic effect on strain TA1532 at doses greater than 0.05 mg/plate under aerobic conditions when $S_9$ mix was present. DCA was non-mutagenic in all strains of all assays, while DCNB was directly mutagenic to strains TA100 and TA1538 at doses of ±1 mg/plate. Two derivatives of the highly cytotoxic DCNB were also found to be mutagenic to strains TA98, TA1538 and TA100 in the presence of $S_9$ mix, their mutagenic effect depending upon the pretreatment of the animals and the composition of the $S_9$ mix. No mutagenic action was found with TCDD.

**79-1336.** Chandurkar, P. S.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **Metabolism of toxaphene components in rats.** *Arch. Environ. Contam. Toxicol.* 8(1): 1-24; 1979. (22 references)

Metabolic fates of $^{14}$C-toxaphene and two of the toxic components of toxaphene were studied *in vitro* by using rat liver enzyme preparations. The enzyme systems involving toxaphene metabolism were characterized, using known cofactors and inhibitors to activate or inhibit individual enzyme reactions. The nature of toxaphene metabolites was studied through derivatization of metabolic products via chemical and enzymatic treatments. The results of the *in vitro* studies were compared to the metabolic patterns observed *in vivo* to ascertain the relative importance of each enzyme system in the total process of toxaphene degradation and excretion. (Author abstract by permission)

**79-1337.** Kendall, M. W. (Dep. Anat., Sch. Med. Sci., Univ. Nevada, Reno, NV 89557) **Light and electron microscopic observations of the acute sublethal hepatotoxic effects of mirex in the rat.** *Arch. Environ. Contam. Toxicol.* 8(1): 25-41; 1979. (41 references)

The fire-ant poison, mirex, was administered via stomach tube (dosage 200 mg/kg) to 50 adult Mai-Wistar male rats and the resultant histopathologic lesions produced in their livers after six days post-intubation are described. Light (LM) and electron microscopic (EM) techniques revealed cellular and subcellular alterations in response to this sublethal dosage. Pathologic lipid accumulations occurred in mirex-exposed rats and this fat appeared in a distinctive peri-

portal zonation pattern. Additional lesions were detected in centrolobular zones with the EM and included severe glycogen depletion, altered regularity in the architecture of rough or granular endoplasmic reticulum (GER), dilated GER cisternae, free ribosomes, and proliferation of smooth endoplasmic reticulum. Periportal hepatocytes exhibited apparent reduction in nunbers of cytoplasmic organelles and development of many, large lipid-containing vacuoles. Myelin figures were sometimes associated with developing lipid (liposomes), suggesting a contribution of myelin membranes to the developing lipid droplets or vice versa. Biochemical studies revealed that glycogen levels dropped markedly, lipid content greatly increased, and protein/DNA and RNA/DNA values decreased. (Author abstract by permission)

**79-1338.** Schoene, K. (Inst. Aerobiol. Fraunhofer-Ges., D-5948 Schmallenberg-Grafschaft, BRD) **Aging of soman-inhibited acetylcholinesterase: inhibitors and accelerators.** *Biochim. Biophys. Acta* 525(2): 468-471; 1978. (9 references)

Twenty-seven compounds, mostly bispyridinium salts, were tested as possible effectors upon the dealkylation (aging) of soman-inhibited acetylcholinesterase. The tests were carried out at pH 7.6 and 25°C. The rate constant of the aging process was 0.04/min in the absence of effectors. The strongest inhibitor of 2 m*M* reduced the rate to 0.08/min. The most potent accelerator raised the rate constant of the aging process to 0.082/min. The semicarbazones HP 70 and HP 71 accelerated the aging reaction, whereas the results with urea and thiourea suggest that the hydrazide group is essential for this special activity. Further research using these compounds is needed to study the process of aging of acetylcholinesterase.

**79-1339.** Larsen, G. L.; Bakke, J. E.; Feil, V. J. (Metab. Radiat. Res. Lab., USDA, Fargo, ND 58102) **Metabolism of [$^{14}$C]terbutryn (2-(tert-butylamino)-4-ethylamino)-6- (methylthio)-*s*-triazine) by rats and goat.** *Biomed. Mass Spectrom.* 5(6): 382-390; 1978. (10 references)

$^{14}$C-Terbutryne was given to a milking goat and to rats in a single oral dose, and the amount of radioactive metabolites in the urine and feces was analyzed. Sixteen metabolites resulted from the *S*-demethylation, conversion of the methylthio group to a hydroxy group, *N*-deethylation, oxidation of the terminal carbon of the ethyl group to a carboxylic acid, oxidation of a terminal carbon of the *t*-butyl group to either an alcohol or a carboxylic acid, or conjugation with glucuronic acid. A flow diagram is given for the isolation of the metabolites from urine and feces using such methods as column chromatography, paper chromatography, thin-layer chromatography, chemical derivatization, and gas-liquid chromatography. Aglycone characterization was done on a Porapak Q column followed by purification by gas chromatography.

**79-1340.** Larsen, G. L.; Bakke, J. E. (Metab. Radiat. Res. Lab., USDA, Fargo, ND 58102) **Mass spectral characterization of the glucuronide conjugates of terbutryn (2-(*t*-butylamino)-4-(ethylamino)-6-(methylthio)-*s*-triazine) metabolites from rats and goat.** *Biomed. Mass Spectrom.* 5(6): 391-394; 1978. (4 references)

Single oral doses of methylthio $^{14}$C-terbutryne or ring $^{14}$C-terbutryne were administered to rats and a goat and the urinary and fecal metabolites were analyzed for radioactivity. Five metabolites of terbutryne were found to be glucuronide conjugates upon examination of mass spectral data of their trimethylsilyl derivatives. Three of the glucuronides were characterized as triazinyl-*S*-glucuronides and two were characterized as alkyl-*O*-glucuronides.

**79-1341.** Olson, K. L.; Boush, G. M.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI) **Behavioral effects of perinatal exposure of chlordimeform in rats.** *Bull. Environ. Contam. Toxicol.* 20(6): 760-768; 1978. (12 references)

Studies were undertaken to determine the behavioral effects of chlordimeform, an acaricide-insecticide, on rats exposed prenatally and postnatally. Pregnant rats were fed 100 μg/kg in their diet beginning on day 5 of gestation, and their offspring were fed in the same way. Behavioral testing was done on the pups on days 7-17 after birth, and on days 70-90. There was significantly slower overall development of swimming ability in treated animals. No significant differences appeared in maze or motivation tests. There was no difference in body weight or physical appearance, and no significant histological changes in any organ system. It is pointed out that the swimming test, which is a complex task involving the integration of a series of reflex responses, is a very sensitive parameter of toxicological effects.

**79-1342.** Verma, S. R.; Bansal, S. K.; Gupta, A. K.; Dalela, R. C. (Pollut. Relevant Res. Lab., Dep. Zool., DAV (PG) Coll., Muzaffarnagar-251001, India) ***In vivo* effect of ATPase in certain tissues of *Labeo rohita* and *Saccobranchus fossilis*, following chronic chlordane intoxication.** *Bull. Environ. Contam. Toxicol.* 20(6): 769-777; 1978. (18 references)

The effect of chlordane on the ATPase system in the brain, gill, liver, and kidney of fresh water teleost fish was studied. The fish were exposed to chlordane in sublethal concentrations of one-half, one-third, and one-sixth of the TL50 (0.03, 0.06, and 0.09 mg/l for *Labeo rohita* and 0.07, 0.14, and 0.21 mg/l for *Saccobranchus fossilis*.) Treatment periods were 30 and 60 days. Total ATPase activity as well as $Na^+$,$K^+$, and $Mg^{++}$ ATPase was measured in various fish tissues. In both fish, there was insignificant ATPase stimulation with the lowest concentration. The inhibition of total, $Mg^{++}$, and $Na^+$,$K^+$ ATPases were similar to each other. Inhibition increased with increased concentration of chlordane. All tissues studied were affected, but maximum inhibition was found in brain and gill, while less was found in kidney, and the least was found in liver.

**79-1343.** Blanke, R. V.; Fariss, M. W.; Guzelian, P. S.; Patterson, A. R.; Smith, D. E. (Dep. Pathol., Med. Coll. Vir-

ginia, Richmond, VA) **Identification of a reduced form of chlordecone (Kepone) in human stool.** *Bull. Environ. Contam. Toxicol.* 20(6): 782-785; 1978. (12 references)

In this study, human stool specimens from patients with a diagnosis of chlordecone (Kepone, CD) toxicity were assayed for organochlorine substances. The procedure involved solvent extraction, clean-up, and gas-liquid chromatography using an electron capture detector. A broad peak eluted after CD, and gas chromatography with chemical ionization mass spectrophotometry identified it as decachloro octahydro- 1,3,4-metheno- 2H- cyclobuta (c,d) pentalen-2-ol. It is thought that the formation of the compound involved attack at the reactive, hydrated carbonyl group of CD.

**79-1344.** Pawar, S. S.; Fawade, M. M. (Div. Biochem. Dep. Chem., Marathwada Univ., Aurangabad, Maharashtra, India) **Alterations in the toxicity of thiodemeton due to the pretreatment of inducers, substrates, and inhibitors of mixed function oxidase system.** *Bull. Environ. Contam. Toxicol.* 20(6): 805-810; 1978. (21 references)

The effects of pretreatment with inducers (phenobarbitol, 3-methylcholanthrene), drug substrates (ethylmorphine, aminopyrine, acetanilide) and inhibitors of heme (nickel chloride, cobalt chloride) and protein (cycloheximide) synthesis on the acute oral toxicity of thiodemeton (disulfoton) were studied. After pretreatment, male and female rats and mice were treated with 12.3 mg/kg (rats) or 9.97 mg/kg (mice) thiodemeton. Pretreatment with phenobarbitol provided 100% protection against thiodemeton toxicity, while 3-methylcholanthrene provided some protection. The toxicity of thiodemeton was enhanced by pretreatment with ethylmorphine, aminopyrine, acetanilide, nickel chloride, cobalt chloride and cycloheximide. The possible mechanisms for these effects are discussed.

**79-1345.** Gupta, R. C.; Paul, B. S. (Dep. Pharmacol., Punjab Agric. Univ., Ludhiana 141004, India) **Influence of malathion (*O,O'*- dimethyl dithiophosphate of diethyl mercaptosuccinate) on body enzymes in dermal subacute toxicity studies in *Bubalus bubalis* species.** *Bull. Environ. Contam. Toxicol.* 20(6): 811-818; 1978. (21 references)

The effect of dermal spraying of malathion on water buffalo (*Bubalus bubalis*) was studied. One-yr-old calves were clipped and sprayed daily with 0.5, 1.0, and 5.0% malathion for 28 days. Blood was drawn by jugular venipuncture and the activities of various enzymes were assayed before, during, and after treatment. The 5.0% dose had a lethal effect after 2-3 exposures. The various biochemical changes seen were dose and time dependent. With all concentrations, cholinesterase activity in RBC's and plasma was inhibited. With 1.0 and 5.0% doses, significant elevation in serum aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase was seen. From these findings, it is suggested that malathion for ectoparasiticidal purposes not be sprayed for more than three days even at recommended concentrations (0.5 and 1.0%).

**79-1346.** Gupta, R. C.; Paul, B. S. (Dep. Pharmacol., Punjab Agric. Univ., Ludhiana 141004, India) **"No-effect level" of malathion (*O,O'*-dimethyl dithiophosphate of diethyl mercaptosuccinate) in *Bubalus bubalis*.** *Bull. Environ. Contam. Toxicol.* 20(6): 819-825; 1978. (15 references)

The no-effect level of malathion in buffalo (*Bubalus bubalis*) was investigated. Healthy calves aged 6-9 mo were given daily oral doses of 0.5, 1.0, or 1.5 mg/kg malathion for 1 yr. Jugular blood samples were taken, and biochemical and hematological parameters were determined. The 0.5 mg/kg/day dose produced no changes in RBC or plasma cholinesterase, aspartate or alanine aminotransferase, blood glucose, serum urea, plasma total protein, hemoglobin, packed cell volume, total RBC's, or total WBC's. The 1.0 and 1.5 mg/kg/day doses produced significant changes in all biochemical parameters studied, and an increase in total WBCs.

**79-1347.** Dikshith, T. S. S.; Datta, K. K. (Ind. Toxicol. Res. Cent., Mahatma Gandhi Marg, Lucknow 226001, India) **Endosulfan: lack of cytogenetic effects in male rats.** *Bull. Environ. Contam. Toxicol.* 20(6): 826-833; 1978. (36 references)

The effects of endosulfan on the somatic and germinal cells of male albino rats were studied. The rats were treated by oral intubation with daily doses of 11.0, 22.0, 36.60, or 55.0 mg/kg of endosulfan for 5 days. Chromosome damage was assessed in bone marrow and spermatogonial cells. While the highest doses resulted in clinical signs of insecticide poisoning and death, there was no significant effect on chromosomes. The frequency of chromatid breaks and ratio of mitotic index were very similar to the control group.

**79-1348.** Drujan, B. D.; Diaz Borges, J. M.; Brzin, M. (Lab. Neurochem., Inst. Venezolano Invest. Sci., Caracas, Venezuela) **Histochemical and cytochemical localization of acetylcholinesterase in retina and optic tectum of teleost fish.** *Can. J. Biochem.* 57(1): 43-48; 1979. (19 references)

The cellular and subcellular localization of cholinesterase activity was studied in the teleost fish *Eugerres plumieri* and *Carassius carassius*. The retina and optic tectum of *E. plumieri* and the retina of *C. carassius* were isolated and examined by raidometric, histochemical, and cytochemical techniques after the application of eserine, BW284C51, and iso-OMPA as selective AChE or BuChE inhibitors. The acetylcholinesterase activity was found to be localized in the ganglion and amacrine cells of the retina, and in the region of photoreceptor synapses and between cell bodies and opposing extensions of the horizontal cells of the inner plexiform layer. The involvement of a cholinergic mechanism at the functional contacts (transferapses) between the horizontal cells is suggested. Histochemical examination of the optic tectum of *E. plumieri* showed fine distinguishable bands of acetylcholinesterase activity suggesting a widespread distribution of cholinergic elements in this segment of the eye.

**79-1349.** Okuno, S.; Takeishi, K.; Seno, T. (Div. Serol. & Virol., Saitama Cancer Cent. Res. Inst., Ina, Saitama 362,

Japan) **Differential effect of a microsomal deacetylase inhibitor on the mutagenicity in *Salmonella typhimurium* of 2-acetylaminofluorene by liver homogenates of guinea pigs, mice and rats.** *Cancer Lett.* 6(1): 1-5; 1979. (15 references)

Paraoxon was used to compare the involvement of deacetylase activity in the mutagenic activation of 2-acetyl aminofluorene (AAF) in liver homogenates from guinea pigs, mice and rats. AAF mutagenicity was almost entirely abolished by paraoxon in male, AAF-resistant, Hartley guinea pigs, male C57Bl mice, and male Sprague-Dawley rats. When guinea pigs were treated with a combination of phenobarbital and 5,6-benzo flavone, the AAF effect was still prevented by the paraoxon. About 60 and 55% of the mutagenic activity was resistant to paraoxon in 10 m*M* concentrations in mice and rats pretreated with the combination, respectively. It is suggested that microsomal deacetylase activity was involved in the mutagenic activation of AAF by guinea pig liver homogenates. Enzyme activity other than the deacetylase activity was considered to be important in the activation by liver homogenates frcm treated mice or rats.

**79-1350.** Wallnofer, P. R.; Ziegler, W.; Engelhardt, G.; Rothmeier, H. (Bayer. Landesanst. Bodenkultur & Pflanzenbau, Abt. Pflanzenschutz, D-8000 Munchen 19, BRD) **Transformation of dinitrophenol-herbicides by *Azotobacter* sp.** *Chemosphere* 7(12): 967-972; 1978. (9 references)

Three strains of *Azotobacter* species were incubated in media containing herbicides at final concentrations of 101 $\mu M$/l (DNOC) and 42 $\mu M$/l (dinoseb). Chemical structures were assigned to some of the metabolites formed: 6-acetamido- 2-methyl- 4-nitrophenol, and 6-acetamido- 2-*sec*-butyl-4-nitrophenol. In media without a nitrogen source all strains of *Azotobacter* sp. tested transformed DNOC and dinoseb to the corresponding acetylated 6-aminophenol derivatives noted above. In the presence of a nitrogen source a considerable depression of bacterial growth was noted, up to 50% of that obtained without a nitrogen source. The 6-aminophenols were almost immediately converted into the corresponding acetylated compounds. The 6-aminophenols of DNOC and dinoseb were only transient metabolites in growing cultures of *Azotobacter* shortly after herbicide transformation began.

**79-1351.** Marei, A. S. M.; Quirke, J. M. E.; Rinaldi, G.; Zoro, J. A.; Eglinton, G. (Org. Geochem. Unit, Sch. Chem., Univ. Bristol, Bristol B58 1TS, England) **The environmental fate of DDT.** *Chemosphere* 7(12): 993-998; 1978. (19 references)

In various experiments, DDT was incubated in hematin, with blood, with heated blood, with sewage sludge, and in the absence of hematin, blood, or sewage sludge. DDD (TDE) was the major product of the incubation of DDT with hematin, but DDT, DBP, DDE, and DDMU were also formed. The major product of incubation with hematin and ammonia was DDD; DDCN was also produced. The incubation of DDT with fresh blood, both with and without ammonia yielded the same metabolites as were detected in the corresponding incubatiosn of DDT with hematin. In each case the major product was DDD. The DBP concentration was increased when ammonia was present. Incubations of DDT and heated blood, with and without ammonia, yielded similar results to the incubations of DDT and fresh blood, suggesting that heme is the active site in blood for DDT degradation. Incubation of DDT with sewage sludge yielded DDCN as the major metabolites; DDD, DDE, DDMU, DDCN and DBP were also present. Sewage sludge and blood incubations produced DDD as the major metabolite.

**79-1352.** Knowles, C. O.; Chang, K. M. (Dep. Entomol., Univ. Missouri, Columbia, MO 65211) **Degradation of formetanate acaricide by twospotted spider mites.** *Chemosphere* 8(1): 3-6; 1979. (5 references)

The metabolism of $^{14}$C-formetanate was studied in the twospotted spider mite, *Tetranychus urticae* Koch. Fifteen vials were coated with the labeled pesticide and about 100 mg of mites were placed in each vial and rotated on a minimill for 2 min to facilite contact with the acaricide. Three vials were held for exposure intervals of 1, 6, 12, 24, or 48 hr and then examined for radioactivity by liquid scintillation spectrometry in fractions prepared from the rinse of the holding vial, external mite surface, internal organic extract, internal water extract, and total mite residues. The external radioactive material (holding vial and mite rinse) decreased from 95.8% at 1 hr to 48.8% by 48 hr. A corresponding increase in internal radioactivity was observed in internal organic extract, water extract, and mite residues of 4.2% at 1 hr to 51.2% at 48 hr showing that the mites readily absorbed the acaricide. Total recovery of radiocarbon averaged 93.6%. A TLC analysis was also done to identify the major metabolites in the internal organic extract. The major formetanate metabolites of the mite were similar to those reported previously for the housefly but differed from those reported in mammals.

**79-1353.** Dean, M. E.; Smeaton, T. C.; Stock, B. H. (Inst. Med. & Vet. Sci., South Australian Inst. Technol., Adelaide, S.A., Australia) **Effects of foetal and neonatal exposure to dicophana [sic] (DDT) in the rat.** *Clin. Exp. Pharmacol. Physiol.* 6(2): 172; 1979.

Female Wistar hooded rats were injected ip with 20 mg of DDT/kg 9 days before delivery. Male offspring of each litter were sacrificed on days 2, 4, 6, 8, or 10 after birth and testicular synthesis and hepatic oxidation of testosterone and plasma androgen levels were measured from pooled tissue samples. Hepatic metabolism of testosterone increased *in vitro*, however, neither testicular synthesis nor plasma androgen levels were effected. The same results were found in male rats treated with human chorionic gonadotrophin to produce elevated testosterone levels. Studies with $^{14}$C-DDT showed that the pesticide crossed the placenta and was found in the fetal rats by day 21 of gestation. Cross-fostering experiments using treated and control rats indicated that the observed response to DDT occurs mainly from exposure after birth, most likely from high levels of DDT secreted in dams' milk.

**79-1354.** Schiller, G. D.; Overstreet, D. H. (Sch. Biol. Sci., Flinders Univ., Bedford Park, S.A., Australia) **Altered sensitivity of the muscarinic acetylcholine receptor induced by chronic administration of the anticholinesterase agent di-isopropyl fluorophosphate (DFP).** *Clin. Exp. Pharmacol. Physiol.* 6(2): 228; 1979.

Rats tolerant to chronically low levels of acetylcholinesterase (AChE) show a behavioral supersensitivity to cholinolytic and subsensitivity to cholinomimetic challenges. A reduced binding of the antimuscarinic agent quinuclidinyl benzilate (QNB) to muscarinic acetylcholine receptor (MAChR) of DFP-tolerant rats is demonstrated. After male Sprague-Dawley rats were trained on an FR-S schedule (30 min) following tolerance development to DFP, a subsensitivity to peripheral challenges of pilocarpine (3, 6, or 9 mg/kg) and bilateral central challenge (16 $\mu$g/0.5 $\mu$l) to the caudate nucleus were noted. In other studies, a 20-30% decrease in the binding of the avid MAChR ligand $^3$H-QNB was observed. When synaptosomal fractions from DFP-tolerant and control rats were incubated with 1 n*M* $^3$H-QNB (1 hr at 37° C), specific binding could be calculated by subracting the $^3$H-QNB bound in the presence of 100 $\mu$*M* oxotremorine. It is suggested that alterations in the sensitivity of MAChR are concomitant with, and may partially induce the buildup of tolerance to chronically low levels of AChE.

**79-1355.** Pipy, B.; Gaillard, D.; Declume, C.; Derache, R. (Groupe Rech., Toxicol. Aliments & Boissons, Inst. Physiol., INSERM U87, F-31400 Toulouse, France) **Effet de l'inhibition ou de l'activation du systeme reticuloendothelial sur la cinetique de disparition sanguine d'un insecticide anticholinesterasique, le carbaryl, chez le rat. [Effects of the inhibition, or the activation, of the reticuloendothelial system on the blood clearance kinetics of an anticholinesterasic, carbaryl, in the rat.]** *C. R. Acad. Sci. Ser. D* 287(11): 1059-1061; 1978. (10 references) (French)

The purpose of this study was to determine whether the reticuloendothelial system (RES) contributes directly or indirectly to the blood clearance kinetics of $^{14}$C-carbaryl. Three groups of 16 male rats were used. The first group received 7.5 mg trioleine to stimulate the RES and the second 10 mg/100 g colloidal carbon to inhibit the RES. The third groups was the control. After IV administration of colloidal carbon to half of the animals in each group, the rate of blood clearance of the carbon was determined. The second half received $^{14}$C-carbaryl (1.5 mg/100 g) through the jugular vein. Blood samples were collected over 20 min and the activity was measured by scintillation. It was found that colloidal carbon reduced RES activity by 70% and trioleine increased it by 160%, when compared to the controls. The blockage of the RES by carbon significantly diminished the speed of carbaryl elimination from the blood; the activation of the RES by trioleine increased the elimination rate. A correlation between the alterations in the blood clearance kinetics of $^{14}$C-carbaryl and colloidal carbon was observed. It was suggested that macrophages may play a role in the disappearance of carbaryl from the blood.

**79-1356.** Keith, J. O. (Ohio State Univ., Columbus, OH) **Synergistic effects of DDE and food stress on reproduction in brown pelicans and ringdoves.** *Diss. Abstr. Int. B.* 39(2): 598; 1978.

The reproductive performance of brown pelicans was documented between 1973 and 1976 in segments of colonies on islands in the Gulf of California, Mexico. Residues of organochlorine contaminants in adult pelicans were determined in 1972, 1973, and 1975. In addition, experimental trials were conducted to determine the effects of different intensities of food restriction, imposed at different times, on the reproductive performance of captive ringdoves with and without exposure to DDE. Dove trials were designed to simulate the timing and intensities of food stress and DDE exposure experienced by brown pelicans. Brown pelican studies defined the kinds and relative importance of problems that contributed to low productivity between 1973 and 1976. Indices to food availability and general observations showed that inadequate productivity was caused by food shortages. The amount of DDE in adult pelicans varied considerably, but average levels were quite high. In ringdove studies, food restrictions markedly reduced nesting success and productivity. However, effects were much greater in birds containing residues of DDE. Results varied depending on when food restrictions were imposed, but overall the effects of food restriction and DDE were synergistic. In birds on full rations, DDE reduced productivity by 23%. A 10% restriction in food reduced productivity about 50% in birds without DDE residues, but in birds with DDE residues, productivity was reduced 87%. Average DDE residues in doves were similar to those found in brown pelicans. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7812350)

**79-1357.** Bainova, A. I.; Vulcheva, V. S. (Inst. Hyg. & Occup. Dis., Med. Acad., Sofia, Bulgaria) **Chronic action of diquat on lungs.** *Dokl. Bolg. Akad. Nauk* 31(10): 1369-1372; 1978. (11 references)

Studies were performed on male and female Wistar rats in which they were subjected to daily doses of diquat (2 mg/kg for 1 or 2 yr, or 4 mg/kg for 2 yr). No behavioral differences or changes in general condition were observed. There was no statistically significant increase in mortality, and no marked deviations in liver, kidneys, and myocardium. The 4 mg/kg group suffered swelling and desquamation of epithelial cells, hyperplastic peribronchial lymph tissues and thickening of the alveolar partitions. No symptoms of malignancy were found. With absorption of 2 mg/kg diquat for 1 yr, only relatively minor changes in the lung occurred.

**79-1358.** Gupta, P. K.; Ehrnebo, M.* (Karolinska Pharm., Karolinska, Hosp., S-10401 Stockholm 60, Sweden) **Pharmakinetics of $\alpha$- and $\beta$-isomers of racemic endosulfan following intravenous administration in rabbits.** *Drug Metab. Disposit.* 7(1): 7-10; 1979. (25 references)

Six TRC colony-bred albino female rabbits were administered 2 mg/kg technical grade endosulfan by iv injection

through the ear veins. The endosulfan contained α- and β -isomers in the ratio of 70:30 and was suspended in peanut oil. Blood from the femoral veins of the rabbits and urine and fecal samples were collected and analyzed by GC (electron-capture detector) in a 1.8 m x 6.5 mm column packed with 1.5% OV-17 + 1.95% OV-210. Graphic analysis of the log of the plasma concentration vs time after iv administration revealed three exponential segments for alpha-, and two for beta-endosulfan. While the terminal slope half-life of α-endosulfan was 235 ± 168 hr, and for β-endosulfan, 5.97 ± 2.42 hr, the total distribution volumes during the terminal slopes were similar (675 ± 246 and 565 ± 126 ml/kg, respectively). Plasma clearance was 2.7 ± 1.33 ml/hr/kg and 70.1 ± 18.6 ml/hr/kg for the α- and β-isomers, respectively.

**79-1359.** Chu, I.; Villeneuve, D. C.; Secours, V.; Becking, G. C.; Viau, A.; Benoit, F. (Environ. Health Dir., Health Prot. Branch, Ottawa, Canada) **The absorption, distribution and excretion of photomirex in the rat.** *Drug. Metab. Disposit.* 7(1): 24-27; 1979. (19 references)

Eight male Sprague-Dawley rats were administered single oral doses of 10 μCi (42.9 mg/kg) $^{14}$C-photomirex in corn oil by gavage. Serial blood samples were withdrawn from cannulated jugular veins. Another 4 rats were dosed via the jugular cannula with 21.5 mg/kg solution of $^{14}$C-photomirex prior to blood sampling. Photomirex was absorbed slowly from the intestinal tract, indicating that the pesticide was absorbed primarily in the small intestine. The blood concentration reached its peak of 8.65 ± 2.97 ppm 4 hr after administration and then declined rapidly. The semilogarithmic decay of blood concentrations following the single iv injection of photomirex was triphasic; concentrations decreased drastically shortly after administration and this decay became less pronounced with time. Approximately 38-42% of the photomirex given orally was eliminated in the feces during the first 3 days, and 52-55% was excreted in 28 days. Less than 0.1% of the total dose was detectable in urine after 24 hr. For the rats treated with 42.9 mg/kg photomirex, the liver, renal fat, skin, and muscle accounted for 9.0, 8.2, 7.5, and 2.4% of the total dose, respectively, after 7 days.

**79-1360.** Mehendale, H. M.; Ho, I. K.; Desaiah, D. (Dep. Pharmacol. & Toxicol., Univ. Mississippi Med. Cent., Jackson, MS) **Possible molecular mechanism of mirex-induced hepatobiliary dysfunction.** *Drug Metab. Disposit.* 7(1): 28-33; 1979. (49 references)

Male Sprague-Dawley rats were administered po 0, 5, 10, and 50 mg mirex/kg/day for 3 days. In one series of experiments, polar metabolites of $^{14}$C-imipramine HC (IMP) at 2 μCi in 0.3 ml were administered through femoral cannulae. Ten mg phenolphthalein glucuronide (PG)/kg was administered through the femoral vein. Biliary excretion of exogenously provided $^{14}$C-IMP was suppressed to 83, 54, and 27% of control value in rats receiving 5, 10, and 50 mg/kg mirex doses, respectively. Metabolite content of the whole livers at the two highest doses was significantly higher than in control livers. Exposure of rats to 5 mg/kg mirex resulted in no discernible changes in the biliary excretion of PG, but excretion was suppressed to 43 and 20% of control value at mirex doses of 10 and 50 mg/kg, respectively. Persistence of mirex-induced biliary excretory dysfunction of the otherwise readily excretable metabolites indicates defective transportation of these substances from the liver to the bile. Pre-exposure to mirex resulted in a dose-related inhibition of $Mg^{++}$-ATPase and $Na^{+}$-$K^{+}$-ATPase activities of the liver. The results indicate that mirex causes interference with energy production and utilization leading to hepatobiliary dysfunction.

**79-1361.** Singh, H. N.; Singh, H. R.; Vaishampayan, A. (Sch. Life Sci., Central Univ. Hyderabad, Hyderabad 500001, India) **Toxic and mutagenic action of the herbicide alachlor (Lasso) on various strains of the nitrogen-fixing blue-green alga *Nostoc muscorum* and characterization of the herbicide-induced mutants resistant to methylamine and *L*-methionine-*DL*-sulfoximine.** *Environ. Exp. Bot.* 19(1): 5-12; 1979. (24 references)

Alachlor (Lasso), butachlor, methylamine, and *L*-methionine-*DL*-sulfoximine were tested for their mutagenicity and toxicity (measured in terms of growth inhibition) on cultures of *Nostoc muscorum* grown on medium with $N_2$, $NO_3$, $NO_2^-$, or $NH_4^+$ as nitrogen source. Alachlor and butachlor were more mutagenic than *N*-methyl-*N*-nitro-*N*-nitrosoguanidine. A higher dose of alachlor was required to cause growth inhibition of the algae at a level caused by butachlor, suggesting that butachlor was the more potent mutagen. Spontaneous or induced mutants were obtained that were resistant to methylamine (MA-R strains) and *L*-methionine-*DL*-sulfoximine (MSO-R strains). The MA-R strains metabolized methylamine as a source of nitrogen. MSO-R strains did not form heterocysts in $NO_3^-$ or $NH_4^+$ medium with or without MSO. Parent *N. muscorum* cultures also did not form heterocysts in these mediums without MSO, but did form heterocysts in both $NO_3^-$ and $NH_4^+$ medium with MSO.

**79-1362.** Short, R. D.; Winston, J. M.; Minor, J. L.; Seifter, J.; Lee, C. C. (Pharmacol. & Toxicol., Midwest Res. Inst., Kansas City, MO 64110) **Effect of various treatments on toxicity of inhaled vinylidene chloride.** *Environ. Health Perspect.* 21: 125-129; 1977. (25 references)

CD-1 mice and CD rats were fed disulfiram, diethyl dithiocarbamate, thiram, cysteine, methionine, *N*-acetyl cysteine, SKF-525A, cobaltous chloride, BAL, phenoxy benzamine, propranolol, vitamin C, or vitamin E before exposure to vinylidene chloride (VDC) vapors for 22-23 hr/day. Serum SGOT and SGPT were determined in both mice and rats, and hepatic nonprotein sulfhydryl levels were determined in livers of male mice that received various treatments for a total of 10 days. Male mice injected ip with 3 mg/kg $^{14}$C-VDC were analyzed for covalent bound radioactivity. Results showed that VDC was more toxic to male mice than male rats in terms of hepatotoxicity, and lethality. Female mice were more sensitive to the lethal effects of VDC than were male

mice. Disulfiram, diethyldithiocarbamate and thiram were the only compounds to alter the toxicity of VDC. No increase was observed in hepatic nonprotein sulfhydryl concentrations in mice that received various treatments for 10 days. The interaction of disulfiram and VDC was investigated after covalent bound radioactivity was found in the liver and kidney of control mice at 4 and 24 hr after administration of labeled VDC. It was found that disulfiram reduced the level of covalent bound radioactivity in the liver and kidney thereby reducing the acute lethal and hepatotoxic effects of inhaled VDC in these animals.

**79-1363.** Bluzat, R.; Seuge, J. (Lab. Zool., Univ. Paris-Sud, Cent. Orsay, F-91405 Orsay, France) **Effets de trois insecticides (lindane, fenthion et carbaryl): toxicite aigue sur quatre especes d'invertebres limniques; toxicite chronique chez le mollusque pulmone Lymnea. [Effects of three insecticides (lindane, fenthion and carbaryl): acute toxicity on four invertebrate species; chronic toxicity on a pulmonate *Lymnea* mollusc.]** *Environ. Pollut.* 18(1): 51-70; 1979. (42 references) (French)

The acute toxicity of lindane, fenthion and carbaryl in *Chaoborus, Cloeon, Gammarus pulex* and *Lymnea stagnalis*, and the chronic toxicity of lindane and carbaryl in *L. stagnalis* were studied. The LC50 values, determined on the second day of exposure, were 0.029 ppm (carbaryl), 0.014 ppm (fenthion) and 0.03 ppm (lindane) for *Gammarus*; 0.48 ppm (carbaryl), 0.012 ppm (fenthion) and 0.092 ppm (lindane) for *Cloeon*; 0.296 ppm (carbaryl), 0.012 ppm (fenthion) and 0.008 ppm (lindane) for *Chaoborus*, and 21 ppm (carbaryl), 6.4 ppm (fenthion) and 7.3 ppm (lindane) for *Lymnea*. At a concentration of 1 ppm, only carbaryl had any effect on mortality in the 43-wk chronic experiment. The mean mortality time was 22.8±5 wk at 1 ppm of carbaryl, versus 49.8±17 wk in the untreated controls. At concentrations of 1 and 2 ppm, lindane caused no significant increase in mortality, but all animals died during the 9th wk at 4 ppm concentration. The animals exposed to 2 ppm of lindane showed a marked decrease in the rate of growth from the third month. Lindane also reduced the fecundity (decrease by 36% at 1 ppm, by 66% at 2 ppm), and the egg fertility. The frequency of double and multiple embryos was 11.6% at 1 ppm, and 23.5% at 2 ppm, versus 2.45% in the controls.

**79-1364.** Sein, K. T.; Chu, N. (Dep. Physiol. & Biochem., Inst. Med. II, Rangoon, Burma) **Liver and kidney glucose-6-phosphatase levels in carbon tetrachloride- and DDT-administered mice.** *Enzyme* 24(1): 72-74; 1979. (12 references)

$CCl_4$ in paraffin oil was injected ip into male mice in doses of 0.05, 0.1, and 0.2 ml/100 g of body weight, and the animals were sacrificed 24 hr later. DDT in groundnut oil was injected im at a dose of 10 mg/100 g for 3 days and mice were sacrificed after the last dose. Assays for glucose-6-phosphatase were carried out on tissue homogenates from the pesticide-treated animals and controls. Liver and kidney activity of the enzyme were decreased 24 hr after the administration of each dose of $CCl_4$. Hepatic glucose-6-phosphatase levels were always lower than kidney levels of the enzyme in mice given the same amount of $CCl_4$. The administration of DDT to the mice did not significantly effect the concentration of glucose-6-phosphatase in the liver or the kidney.

**79-1365.** Gupta, S. D.; Moorthy, M. V.; Chowdhri, B. L.; Ghosh, A. K. (Defense Res. & Dev. Establ., Gwalior 474002, India) **Effect of thiamine hydrochloride on the blood level of 2-formyl 1-methyl pyridinium oxime chloride (2-PAM.Cl) in rats.** *Experientia* 35(2): 249-250; 1979. (11 references)

The reactivator of phosphorylated acetylcholinesterase, 2-PAM, is known to be rapidly excreted from the body. Attempts to increase the length of time that 2-PAM stays in the body have uncovered that the use of nicotinamide was inconclusive and the use of thioamine hydrochloride in human male volunteers prolonged the biological half-life of the reactivator. The present study investigates the effects of thiamine hydrochloride given to male and female albino rats treated with 2-PAM. 2-PAM is believed to complete with thiamine HCl for the secretory mechanism in the renal tubules which slows the escape of this cholinesterase reactivator. Results showed that the administration of thiamine hydrochloride increases the retention time of 2-PAM in female rats. Without the use of thiamine hydrochloride, the males had a longer body retention of 2-PAM than did the females.

**79-1366.** Hess, F. D. (Dep. Bot. & Plant Pathol., Purdue Univ., West Lafayette, IN 47907) **The influence of the herbicide trifluralin on flagellar regeneration in *Chlamydomonas*.** *Exp. Cell Res.* 119(1): 99-109; 1979. (25 references)

The effect of trifluralin on *in vivo* flagellar regeneration in cells of the algae *Chlamydomonas eugametos* Moewus was studied. After cultures grown on medium containing trifluralin reached the desired cell density, flagella were removed by homogenization and the cells were recultured to study the regeneration of new flagella. Cells were examined under an interference-contrast microscope equipped with a micrometer. After 1.5 hr, no interference of flagellar growth was observed in cells treated with trifluralin at levels of 0.1 $\mu M$. Concentrations of trifluralin above 5 $\mu M$ prevented the onset of flagella regeneration. Flagella length decreased as the concentration of the trifluralin in the culture medium increased. When cycloheximide was added to trifluralin-treated cultures, no interference to tubulin synthesis was observed. When trifluralin was removed from the cultures, only 50% of the original regneration capacity was regained. Trifluralin did not cause a breakdown of previously assembled flagella, but only interfered with the assembly of new microtubules. It was concluded from these results that trifluralin acts to prevent tubulin assembly into spindle microtubules that form the flagella of the algae.

**79-1367.** Venera, G. D.; Morisoli, L. S.; Rodriguez Garay, E. A. (Dep. Physiol., Fac. Biochem. Sci., Natl. Univ. Rosario, Rosario, Argentina) **Degradation of parathion to *p*-nitro-**

**phenol by livers of rats treated with phenobarbital.** *Farmaco Ed. Prat.* 33(12): 549-553; 1978. (11 references)

Livers obtained from rats fed on either a 20% casein diet or a protein-free diet were homogenated and incubated with increasing quantites of parathion. The *in vitro* *p*-nitrophenol formation was measured spectrophotometrically and was quantitated from a standard curve of *p*-nitrophenol treated in the same manner. A group of rats on protein diets were also treated with phenobarbital. The rate of *p*-nitrophenol formation was found to be directly related to the logarithm of the parathion dose administrated. The *p*-nitrophenol formation was decreased in liver homogenates of rats fed protein deficient diets, and increased in liver homogenates of rats additionally treated with phenobarbital. In the case of the phenobarbital-treated rats, the slope of the regression line was significantly higher than the slope of the curves plotted for *p*-nitrophenol formation of the other two experimental groups. These findings are in agreement with previous studies which showed that the NADPH-dependent liver enzymes needed for hydrolysis of parathion to *p*-nitrophenol are decreased by protein deficient diets.

**79-1368.** Buslovich, S. Yu.; Aleksashina, Z. A.; Kolosovskaya, V. M. (Beloruss. Hyg. Res. Inst., Minsk, USSR) **Vliyanie fenobarbitala na mebriotoksicheskoe deistvie 2-metil-4-khlorfenoksiuksusnoi kisloty. [Effect of phenobarbital on** the embryotoxic effect of 2-methyl-4- chlorophenoxyacetic **acid.]** *Farmakol. Toksikol. (Moscow)* 42(2): 167-170; 1979. (9 references) (Russian)

The effect of phenobarbital (PB), given ip in 80 mg/kg/day doses on the embryotoxic effect of 2-methyl-4-phenoxyacetic acid (2M-4C), given in a single dose corresponding to 50% of LD50 ig on the 9th or 10th day of pregnancy, was studied in 87 Wistar rats. PB was given over 1, 2, or 3 days immediately before 2M-4C. 2M-4C, given alone without PB on day 9 of pregnancy, caused an increase in the number of resorptions from 0.3/female in the untreated controls to 5.7/female; the number of live fetuses was 5.5/female versus 8.4 in the controls. The overall embryonal mortality was 56.4% versus 27% in the controls. When given on the 10th day, 2M-4C increased the number of resorptions to 3.4/female, and the embryonal mortality to 36.8%. The 3-day pretreatment with PB reduced the number of resorptions to 1/female and 0.7/female in the groups treated with 2M-4C on the 9th and 10th days, respectively, and the embryonal mortality to 23.2% and 30.6%, respectively. The weight and size of the embryos were also higher than after treatment with 2M-4C alone. The findings indicate the definite protective action of PB, which is due to the stimulation of metabolic oxidation, leading to a higher rate of metabolism of 2M-4C.

**79-1369.** Parodi, L. A.; Pincus, J. F.; Josephson, L.; Simon, S. R. (SUNY, Stony Brook, NY 11794) **Kinetic studies of the *p*-nitrophenyl phosphatase reaction of Na-K ATPase.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 242; 1979.

We have measured *p*-nitrophenyl phosphatase (pNPPase) activity of *E. electricus* Na-K ATPase over a range of pNPP, K ion, and Mg ion concentrations at different pH values, to resolve several previous conflicting interpretations of this reaction. The true substrate is free pNPP, not MgpNPP. Free Mg ions must bind prior to pNNP in an obligate ordered reaction. In addition to binding in a productive mode, Mg ions may also bind in an inhibitory mode with weaker affinity. Mg inhibition is competitive with K ion binding in the absence of $Na^+$ ATP. In the presence of $Na^+$ ATP, Mg ions no logner compete with K ion binding in the pNPPase reaction. Mg ions also inhibit Na-K ATPase activity, but solely by reducing the affinity of the enzyme for Na ions with no effect on K ion binding. Ca ions are strong inhibitors of the pNPPase reaction: the inhibition increases sharply with increasing pH and is competitive with K ion binding. Ca ions also inhibit Na-K ATPase activity with similar pH dependence, but are exclusively competitive with Na ion binding. The pesticide Kepone (chlordecone) inhibits K ion binding in the pNPPase reaction in a fashion similar to its inhibition of Na binding but dissimilar to its inhibition of K binding in the ATPase reaction. K ion activation of pNPPase is strongly cooperative; under conditions of high Mg concentrations especially, the Hill constant for activation may exceed 2, suggesting that K ions may be binding to the sites normally occupied by Na ions in the ATPase reaction. [Abstract 89 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1370.** Chambers, J. E.; Yarbrough, J. D. (Mississippi State Univ., Mississippi State, MS 39762) **Disposition and excretion of mirex, 2,8-dihydromirex and 5,10-dihydromirex by adult rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 266; 1979.

Adult male and female rats were given single oral doses of 38 μg per rat (0.17 μg/kg) of $^{14}$C-mirex (dodecachlorooctahydro- 1,3,4-metheno-2H-cyclobuta[CD] pentalene), $^{14}$C-2,8-dihydromirex or $^{14}$C-5,10-dihydromirex in soybean oil. Urinary and fecal excretion of radioactivity was monitored for 2 wk. Tissues levels of radioactivity were determined at 1 and 2 wk. Fat had the highest concentration of radioactivity in all tissues between 1 and 2 wk in females; this same trend was present but less consistent in males. Liver, lung, adrenal glands and ovaries possessed relatively high concentrations of radioactivity while brain, kidney, skeletal muscle, spleen, testes and heart possessed generally lower concentrations of radioactivity. Excretion of radioactivity was greater in the feces than in the urine. Excretion of all three compounds in both sexes occurred in the feces during both wk. The urinary excretion of mirex and 2,8-dihydromirex in males and all 3 compounds in females was negligible during the second wk whereas the excretion of 5,10-dihydromirex in males was significant during the second wk. It appears that some of the dechlorinated derivatives of mirex may be more readily excretable than the parent compound. [Abstract 217 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1371.** Pritchard, J. B.; James, M. O. (NIEHS, NIH, Research Triangle Park, NC 27709) **Excretion of anionic**

**xenobiotics by marine fish: influence of conjugation.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 266; 1979.

Conjugation reactions are generally believed to facilitate excretion of foreign compounds. However, comparison of the rates of phenylacetic acid (PA) and 2,4-dichlorophenoxyacetic acid (2,4-D) excretion in several marine species has demonstrated an inverse correlation between the excretion, suggesting that the taurine conjugates may be more poorly excreted than parent compounds. In these studies, renal transport of PA and 2,4-D were compared with their taurine conjugates in the winter flounder (*P. americanus*) using isolated renal tubules *in vitro* and renal clearance studies in vivo. Incubation of flounder tubules with 1 $\mu M$ PA for 60 min gave tissue-to-medium ratios (T/M) of 10. Uptake was energy dependent, demonstrated saturation, and was probenecid sensitive. Uptake of phenlyacetltaurine (PAT) gave comparable results except that it was about 25% less during the first 10 min of incubation. Both compounds were far less well transported than 2,4-D, which gave 60 min T/M of 30 to 40. *In vivo*, the clearance of either PA or PAT averaged 40 to 50 times the glomerular filtration rate (GFR). 2,4-D clearance was nearly 500 times the GFR. Thus, it appears that the differences in excretion rate for this pair of compounds derive primarily from differences in the renal transport capacities for PA and 2,4-D, not from poor excretion of PAT relative to PA. [Abstract 216 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1372.** Hassing, J. M.; Stohs, S. J. (Univ. Nebraska Med. Cent., Omaha, NE 68105) **Comparative induction of intestinal mixed-function oxidase activities by various polycyclic hydrocarbons.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 365; 1979.

The effects of 3-methylcholanthrene (MC), benz(a)anthracene (BA), 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) and Arochlor-1254 on the induction of microsomal mixed-function oxidase activity in rat intestinal mucosa were compared. Eighteen hr after ig administration of the inducing agent, intestinal mucosal microsomes were prepared and the activities of 7-ethoxy- resorufin (ER) deethylase and benz(a)-pyrene (BP) monoxygenase determined. MC demonstrated the greatest inductive potency in intestinal microsomes of the agents tested, stimulating ER deethylase activity 10-fold over control activity, and BP monooxygenase activity 30-fold. TCDD administration resulted in a 10-fold stimulation of BP monooxygenase activity over control levels. BA was the least potent inducer, producing a 70% stimulation of ER deethylase activity. Intestinal mixed-function oxidases are highly susceptible to induction by polycyclic hydrocarbons. Dramatic and selective increases in activity are observed within 18 hr after oral administration of these agents. [Abstract 715 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1373.** Ebner, K. (Ohio State Univ., Dep. Pharmacol., Columbus, OH 43210) **The influence of PCB-1254 and dietary protein on carbamyl phosphate synthase (CPS I).** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 365; 1979. (2 references)

CPS I is inhibited following PCB-1254 treatment (Ebner & Couri, Biochem. Med. Oct., 1978). This effect on CPS I was further investigated by acclimating for five days groups of 12 male Wistar rats on protein diets (8%, 24% and 70% casein) and then treating for four days with PCB-1254 (30 mg/kg/day, po). Control and treated liver mitochrondria were isolated and CPS I assayed according to Yamazaki and Graetz (Arch. Biochem. Biophys. 178:19, '77). Additions to the assay included malate (Mal), and glutamate (Glu) + Mal. CPS I was significantly less for the 70% PCB-1254 treated group for all substrate combinations tested, indicating a dietary influence. Octanoate ($C_8$) (50-100 m$M$/mg) to Glu+Mal inhibited and stimulated the 8% and 24% PCB-1254 treated groups, respectively. Aminooxyacetate nullified this $C_8$ effect and was without effect by itself. Rotenone addition to the Glu+Mal+ATP+$C_8$ enhanced CPS I activity only in controls while the treated groups were significantly inhibited. In addition, treatment caused a decreased weight gain and food consumption, and significant enlargement of the liver. These results suggest altered $NH_4^+$ metabolism by $C_8$ and a rotenone activated ATPase with PCB-1254 treatment. The 70% casein group was more sensitive to CPS 1 inhibition following liver homogenate preincubation with free fatty acids ($C_8$ or palmitate). [Abstract 720 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1374.** Story, D. L.; Freedland, R. A. (Dep. Physiol. Sci., Univ. California, Davis, CA 95616) **DDT-induced alterations in the concentration of several amino acids in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 394; 1979.

The effect of DDT feeding on liver and plasma amino acid levels of male rats was studied. Two groups of rats were fed ground laboratory chow supplemented with 1000 ppm *o,p'*-DDT for two wk while two groups were fed the ground chow diet. One group of rats from each treatment was used without prior starvation. Free amino acids in liver and plasma samples were quantitated on an amino acid analyzer. DDT feeding had no effect on plasma amino acid levels but resulted in an increase in the concentration of liver isoleucine, ornithine, phenylalanine, serine and threonine. After starvation, the levels of isoleucine, phenylaline, serine and threonine in livers of treated rats were similar to levels observed in starved controls. It appears that DDT has the effect of increasing the concentration of several liver amino acids and subsequent starvation will alleviate these changes. Further studies showed that the activity of liver serine dehydratase is decreased in rats fed DDT, which is consistent with the finding of increased levels of serine and threonine in liver of DDT-fed rats. [Abstract 880 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1375.** Kupfer, D.; Miranda, G.; Navarro, J.; Piccolo, D. E.; Theoharides, A. (Worcester Found. Exp. Biol.,

Shrewsbury, MA 01545) **Effect of inducer of microsomal monooxygenase on the *in vitro* 19- and 20- hydroxylation of prostaglandins (PG's).** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 408, 1979; 1979. (1 reference)

Previous investigations indicated that the hydroxylation of PG's at $C_{19}$ and $C_{20}$ is catalyzed by a hepatic cytochrome P450-mediated monooxygenase (Kupfer et al. (1978), J. Biol. Chem. *253*: 2804 (1)). To determine whether the 19- and 20-hydroxylation activities are inducible, the current investigation examines the effect of inducers of monooxygenase on the *in vitro* hydroxylation of several PG's in the guinea pig. Male guinea pigs 4-5 per group were injected with *p,p* DDT (100 mg/kg for 7 days), benzpyrene (40 mg/kg once) or Arochlor 1254 (5000 mg/kg once); controls received 0.4 ml corn oil. $PGE_1$, $PGE_2$, $PGA_1$, and $PGA_2$ (1 m*M*) were incubated with liver microsomes and NADPH for 30 min at 37°. The products of the reaction were converted to PGB derivatives by base and chromatographed on TLC and reverse phase HPLC. The products were characterized as 19-hydroxy- and 20-hydroxy- $PGB_1$ and $PGB_2$ derivatives by HPLC and GC/MS. 19-Hydroxylation was the prime path of metabolism in the guinea pig; furthermore results demonstrate that the three inducers enhanced the hydroxylation of PG's. The ratio of hydroxylated products (treated/control) for $PGA_1$ with *p,p'*-DDT was 2.7, with benzpyrene, 3.7, and with Arochlor 1254, 4.3. The same ratio for $PGE_1$ with benzpyrene was 3.5, and with Aroclor 1254, 2.4. With $PGA_2$ the hydroxylated products ratio was 2.4 with benzpyrene, and 2.4 with Arochlor 1254. With $PGE_2$ these ratios were 5.3 with benzpyrene and 3.3 with Arochlor 1254. The increase in hydroxylation was at $C_{19}$ suggesting that the hydroxylation of PG's at the two sites is catalyzed by different monooxygenases (P450's). [Abstract 948 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1376.** Greenlee, W. F.; Poland, A. (Sch. Med. & Dent., Univ. Rochester, Rochester, NY 14642) **Hepatic nuclear uptake of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin in inbred mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 425; 1979.

We have obtained evidence indicating that biologically specific hepatic nuclear uptake of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), a potent inducer of cytochrome $P_1$-450 and associated monooxygenase activities, is mediated by its cytosol receptor protein. Specific hepatic nuclear uptake of [$^3$H] TCDD in C57BL/6J mice correlated temporally with a fall in the specific binding capacity of the cytosol fraction for the inducer measured in vitro. The hepatic nuclear uptake of [$^3$H] TCDD was 5-fold greater in C57BL/6J mice than in DBA/2J mice and was displaceable by the simultaneous administration of unlabeled TCDD, but not by inactive congeners. *In vitro*, the specific uptake of [$^3$H]TCDD by hepatic nuclei from C57BL/6J mice was 10- to 15-fold greater when incubated with charged cytosol from the same strain than when incubated with heat-inactivated or trypsin-treated hepatic cytosol from C57BL/6J mice, hepatic cytosol from DBA/2J mice, or a solution of bovine serum albumin. The ability of unlabelled polycyclic aromatic hydrocarbons and halogenated aromatic congeners to compete for the specific nuclear uptake of [$^3$H]TCDD *in vitro* mirrored their ability of compete with the radioligand for specific binding sites in the cytosol. [Abstract 1034 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1377.** Tada, S.; Namba, T.; Grob, D. (Maimonides Med. Cent., Brooklyn, NY 11219) **Tetramisole and anticholinesterase activity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 431; 1979.

Levamisole, levo-isomer of tetramisole, has been used as a nematocide, and also found effective in some patients with autoimmune diseases and malignancies probably through its restorative action of immune reactions, although dexamisole, dextro-isomer of tetramisole, has been inactive. Because of interest in tetramisole as a potential therapeutic agent for myasthenia gravis, its anticholinesterase activity was studied. pI50 against human motor endplate cholinesterase, which was studied using isolated membrane fraction of human intercoastal muscle, was 3.59 for levamisole and 3.02 for dexamisole, and therefore these are weaker inhibitors than edrophonium (5.17), pyridostigmine (6.15), neostigmine (7.33), and ambenonium (8.52). A similar relationship was found in red cell cholinesterase inhibition. Levamisole and dexamisole inhibited human plasma cholinesterase more strongly (4.45 and 3.89, respectively) than human motor endplate cholinesterase, and therefore are less specific inhibitors of the latter. Following administration of 50 mg levamisole orally in 4 patients with myasthenia gravis, plasma cholinesterase was inhibited by 14.6%, which is in accord with the reported plasma concentrations. In this condition, human motor endplate cholinesterase would have been inhibited less than 2%. Therefore, levamisole at this dose would not affect neuromuscular transmission by inhibition of motor endplate cholinesterase. [Abstract 1071 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1378.** Dohi, T.; Murad, F. (Div. Clin. Pharmacol. Univ. Virginia, Charlottesville, VA 22908) **Pyruvate and other metabolites increase cyclic GMP levels in rat hepatocytes and kidney cortex.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 432; 1979.

Since redox events can alter guanylate cyclase activity and cyclic GMP levels in tissues, the effects of pyruvate and other materials on cyclic GMP levels in rat hepatocytes and kidney cortex slices were examined. Pyruvate (2 to 20 m*M*) increased cyclic GMP levels 2- to 7-fold. Effects were observed within 2 min and maximal at 5 to 15 min. The effects were dependent upon pyruvate concentration and observed in the absence or presence of 0.2 m*M* methyl-isobutylxanthine which also increased cyclic GMP levels about 2-fold. The effect of pyruvate required 1.3 to 2.6 m*M* $Ca^{2+}$ in the medium. High concentrations of pyruvate (5 to 20 m *M*) increased cyclic AMP levels 30 to 50%; lower concentrations had no effect. Using isolated hepatocytes, acetate, lactate, succinate, α-ketoglutarate, oxalacetate, acetoacetate, β-hydroxybutyrate and dithiothreitol at 1 to 10 m*M* also increased cyclic GMP levels. Citrate had no effect. Oligomycin,

antimycin, rotenone, cyanide and dinitrophenol decreased the effect of pyruvate. Arsenate and pentenoic acid decreased the pyruvate effect in hepatocytes while fluorocitrate (0.1 to 0.4 m*M*) and dithiothreitol (1 to 5 m*M*) increased the effect of pyruvate. These studies indicate that metabolic and redox events can regulate cyclic GMP synthesis. The mechanism(s) that result in cyclic GMP accumulation in our studies are not understood at present. [Abstract 1076 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1379.** Ng, W. W.; Miller, R. K. (Dep. Pharm. & Toxicol., Univ. Rochester, Rochester, NY 14642) **Vitamin $B_{12}$ uptake in human placental sections.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 439; 1979. (1 reference)

Therapeutic administration of Vitamin $B_{12}$ ($B_{12}$) may saturate the plasma $B_{12}$ binding capacity of the protein carriers and result in significant levels of free $B_{12}$. The benefit of free $B_{12}$ to human fetal development depends on the movement and distribution of $B_{12}$ in the placenta. Using an *in vitro* slice technique (Am. J. Physiol. 227:1236, '74), $B_{12}$ is shown to be accumulated in the human term placenta. Tissue-to-medium (T/M) ratios of $^{57}$Co-$B_{12}$ 33.5 p*M* was 6.5 ± 0.4 at 37°C after a 2 hr incubation with 10 m*M* glucose when expressed as (cpm/g tissue)/(cpm/ml medium). This high concentration of $B_{12}$ was not reduced by the use of metabolic inhibitors: ouabain, ethacrynic acid, 2,4-dinitrophenol and/or iodoacetate at 0.1 m*M*. Following 2 hr of incubation with free $B_{12}$, placental sections were homogenized. The percentage of radioactivity in the cytosol was found to be concentration dependent. At 33.5 p*M* and 0.365 n*M* of $^{57}$Co-$B_{12}$ the cytosol contained 20% and 64% of the radioactivity respectively. The corresponding amounts of intracellular $B_{12}$ that were associated with cellular components were 96% and 71% as determined by albumin-coated charcoal or acid precipitation. Thus, the uptake of free $B_{12}$ appeared to be energy independent and there was an intracellular binding component accounting for T/M ratios of greater than one. [Abstract 1112 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1380.** Taylor, M. A.; Sancilio, L. F.; Mathur, P. (A. H. Robins Co., Richmond, VA 23220) **Interaction between warfarin and anti-inflammatory drugs in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 440; 1979.

The interaction between 1.34 mg/kg ip of warfarin (sodium) and orally administered phenylbutazone 150 mg/kg, indomethacin 8 mg/kg, acetylsalicyclic acid 300 mg/kg, diflunisal 75 mg/kg, ibuprofen 150 mg/kg, tolectin 50 mg/kg, ketoprofen 8 mg/kg, and amphenac 8 mg/kg was studied in male Charles River Sprague-Dawley rats. The anti-inflammatory compounds were administered 24 hr prior to, or 18 hr following, the administration of the anticoagulant. Fasted rats show a higher response to warfarin than fed rats. Pretreatment (-24 hr) with phenylbutazone decreased the response to warfarin in fasted and fed rats. Post-treatment (+ 18 hr) with phenylbutazone enhanced the warfarin response only in fed animals. Pretreatment (-24 hr) with indomethacin to fed rats increased the action of the warfarin while the other 6 compounds exerted no effect. Upon post-treatment (+ 18 hr) significant increase in the hypoprothrombinemia occurred with phenylbutazone (+ 117%), diflunisal (+93%), acetylsalicyclic acid (+91%), ibuprofen (+61%), indomethacin (+40%), tolectin (+34%), and ketoprofen (+25%). Amphenac was inactive. Since this interaction (enhancement) has been seen clinically with warfrin and phenylbutazone and inconsistently or none at all with warfarin and the other anti-inflammatory compounds, the rat is apparently more sensitive than man in demonstrating this type of drug interaction. [Abstract 1120 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1381.** Jones, K. G.; Sweeney, G. D. (McMaster Univ., Hamilton, Ontario L8S 4J9, Canada) **Iron deficiency prevents liver toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 536; 1979.

Iron has long been implicated in the pathogenesis of porphyria cutanea tarda (PCT) in man, and parenteral iron has been shown to accelerate the production of experimental porphyria in animals. To determine whether iron deficiency would prevent the development of porphyria caused by the potent hepatotoxin and porphyrinogenic agent 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), male C57BL/6J mice were bled twice weekly from the cavernous sinus until their hemoglobin dropped to 5.5 g/dl and were kept on an iron-deficient diet. Treatment with TCDD (25 μg/kg/wk, ip) for 11 wk caused a 10-fold increase in urine porphyrin and a decrease in uroporphyrinogen decarboxylase (UD) to 20% of the mean control level in mice with normal iron stores, but no change was seen in iron-deficient animals. Iron deficiency also protected against skin lesions and hepatocellular damage caused by TCDD. The liver parenchyma showed extensive histologic evidence of damage in TCDD-treated animals receiving normal dietary iron but iron-deficient animals appeared to be protected. Increases in liver weight and induction of microsomal enzymes were comparable in both groups. We conclude that the aspects of TCDD toxicity which we monitored are dependent on tissue iron. [Abstract 1618 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1382.** Gasiewicz, T. A.; Holscher, M. A.; Neal, R. A. (Cent. Toxicol. Vanderbilt Univ., Nashville, TN 37232) **The effect of total parenteral nutrition (TPN) on the toxicity of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) on the rat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 537; 1979.

The effects of TPN, administered via a cannula in the jugular vein, upon the toxicity of TCDD in rats has been studied. Control animals have been maintained on TPN for 45 days without gross or histological abnormalities. At doses of 50 or 100 μg TCDD/kg, rats demonstrated a weight gain similar to that of TPN controls, but died at days 11-18 following treatment. Gross examination of moribund TCDD-treat-

ed animals revealed icterus, thymic atrophy, increased adipose tissue depots, and an enlarged liver. The liver weights ranged from 2-3 times greater than those from TPN control animals. Histologically the livers were severely necrotic. Viable cells were markedly swollen and disorganized. Dilated sinusoids and extensive vacuolization of hepatocytes were prominant features. Whereas hepatic glycogen stores were depleted, the total content of water, lipid, protein and DNA was increased. Statistically significant increases in serum iron, bilirubin, alkaline phosphatase, SGOT, SGPT, LDH and cholesterol were found in the TCDD-treated animals. Serum protein and glucose levels were decreased except in a few severely moribund animals in which hyperglycemia was observed. In comparison to ad lib fed rats treated with the same dose of TCDD, the liver damage in the TPN TCDD-treated rats was histologically and biochemically more severe. [Abstract 1624 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1383.** Abou-Donia, M. B.; Graham, D. G.; Reichert, B. L.; Timmons, P. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity of *s,s,s*-tributyl phosphorotrithioite (merphos): effect of route of administration.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 537; 1979.

Oral administration of single doses of merphos ranging between 200 and 2,000 mg/kg caused mild ataxia ($T_1$). The dose of 200 mg/kg was the "threshold single dose" below which no effects were produced. The effect of a daily oral administration of small and in themselves ineffective doses of merphos ranging between 0.5 and 20 mg/kg can accumulate and results in neurotoxicity in hens. The dose 0.1 mg/kg showed no effect. No histologic changes were seen in tissues from hens given oral single doses, which was consistent with the mild ataxia observed. When small daily oral doses of merphos were given, equivocal histopathologic changes were seen only on the spinal cords of some hens, and no peripheral nerve damage was detected in these hens. By contrast, topical application of single or daily doses of merphos to hens caused degeneration of nerve tissues. Degeneration of myelin and axons in the spinal cord was the most consistent histologic change and was identical to that found in tri-*o*-cresyl phosphate control hens. It is proposed that topical application may be an important method for evaluation of the neurotoxic effect of organophosphorus esters. [Abstract 1628 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1384.** Ousterhout, J. M.; Struck, R. F.; Nelson, J. A. (Dep. Pharmacol. & Toxicol., Univ. Texas Med. Branch, Galveston, TX 77550) **Estrogenic properties of methoxychlor metabolites.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 537; 1979. (2 references)

The insecticide methoxychlor [MeOCl; 1,1,1-trichloro-2,2- bis(p-methoxyphenyl)ethane] is weakly estrogenic *in vivo*. The purified compound, however, is relatively inactive as an inhibitor of specific $^3$H-estradiol ($E_2$) binding *in vitro* unless it is first incubated with rat liver microsomes (Nelson et. al., J. Tox. Env. Health 4: 325, 1978). The principal metabolites of MeOCl in mice and rats result from *O*-demethylation producing a mono and a bis-phenol (Kapoor *et. al.*, J. Agric. Food Chem. *18*: 1145, 1970). We synthesized these two compounds and compared their ability to inhibit the binding of $E_2$ to rat uterine cytosol *in vitro*. The concentrations required to inhibit $E_2$ binding by 50% (I50) were 0.6 $\mu M$ and 0.2 $\mu M$ for the mono and the bis-phenol, respectivitly. Diethylstilbestrol (DES) is 100 times as potent as the bis-phenol, with an I50 of 0.002 $\mu M$. Inhibition of $E_2$ binding by DES, the monophenol and/or the bis-phenol was not additive at maximally effective concentrations. Displacement of $E_2$ from 8S receptor sites by the bis-phenol was indicated by sucrose-density gradient centrifugation. After liver microsomal incubation, approximately 3% of $^{14}$C-MeOCl was converted to the mono-phenol, while only 0.2% was converted to the bis-phenol. These results suggest that the estrogenic effects of MeOCl *in vivo* are primarily due to metabolism to a mono-phenol which resembles DES in its mode of action. [Abstract 1625 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1385.** Desaish, D.; Mehrotra, B. D.; Kinzey, R.; Trottman, C. H (Dep. Neurol., Univ. Mississippi, Jackson, MS 39216) **Effects of toxaphene, Kepone and mirex on key gluconeogenic enzymes in rat liver.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 538; 1979.

The effects of toxaphene (T), kepone (K) (chlordecone) and mirex (M) on glucose-6-phosphatase (G-6-Pase) and fructose-1, 6-di- phosphatase (F-1, 6-DPase) were investigated. Male Sprague-Dawley rats were fed diets mixed with 25, 50 and 75 ppm of T for 8 wk, whereas K and M were mixed with corn oil and fed to rats po for 3 days. G-6-Pase was determined utilizing the whole homogenate and F-1, 6-DPase was determined in 100,000 x g supernatent of the liver homogenate. Both enzyme activities were markedly increased in rats fed with T as compared to control rats. The increases were dose dependent reaching a maximum stimulation of 70% at the highest dose of T. However, the responses of these enzymes to K and M treatment are somewhat different from T. G-6-Pase and F-1, 6-DPase were inhibited by M but stimulated by K. The present results suggest that T, K and M may be affecting the process of gluconeogenesis. [Abstract 1631 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1386.** D'Ambrosio, S. M.; Hall, K.; Hart, R. W.; Lewis, N. J. (Ohio State Univ., Columbus, OH 43210) **Pesticide induced DNA damage in mammalian cells.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 539; 1979. (1 reference)

Normal human skin fibroblasts and Syrian hamster embryo (SHE) cells were treated with aldrin and dieldrin. Although both of these pesticides bind to cellular DNA of normal human fibroblasts (C-153), no unscheduled DNA synthesis is induced. To determine whether pesticides induce DNA damage recognizable by endonucleases, we incubated

nuclei prepared from C-153 cells with endonuclease prepared from *M. luteus*. Single strand-breaks were detected using our recently developed alkaline agarose gel electrophoresis system (*J. Cell Biol.* 79, 145a) for detecting non-radiolabeled high molecular weight DNA in cells treated with 10 and 100 $\mu M$ dieldrin and incubated with the preparation. No breaks were detected in control cells incubated with endonuclease or when cells were treated with the pesticides alone. We also determined the effect of dieldrin and aldrin upon DNA replication, and the ability of SHE cells to synthesize high molecular weight daughter DNA using alkaline sucrose gradient sedimentation. Results indicate that both aldrin and dieldrin at 10 $\mu M$ and 100 $\mu M$ inhibit DNA replication. Less of the daughter DNA sediments as high molecular weight DNA following treatment with these pesticides. These data indicate that halogenated hydrocarbons: a) damage cellular DNA; b) produce damage recognized by endonucleases obtained from *M. luteus*; and c) interfere with normal DNA replication. [Abstract 1637 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1387.** Dillwith, J. W.; Lewis, R. A. (Dep. Biochem., Univ. Nevada, Reno, NV 89557) **Inhibition of DNA polymerase activity by captan.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 541; 1979.

Captan, *N*- (trichloro methylthio)- 3a,4,7,7a- tetrahydro phthalimide is known to inhibit DNA synthesis in cells and in isolated nuclei. In this study we have investigated the mechanism of captan's action. Extracts of $\beta$-polymerase, isolated from beef liver nuclei are inhibited (38%) by captan exposure (0.1 m$M$). Furthermore, when this extract is treated with captan and subsequently fractionated on a sucrose gradient, the $\beta$-polymerase activity (3.3S peak) remains inhibited (36%). When DNA is treated with captan and used as a template for the $\beta$-polymerase, no inhibition of the polymerase reaction is observed. Thus, the enzyme not the template appears to be the site of captan's action. Interestingly, the interaction of the $\beta$-polymerase with captan is affected by the polymerase:DNA ratio. Decreasing the amount of enzyme added to a standard assay results in decreasing inhibiton by captan and increasing the DNA concentration results in a decreased inhibition. Thus, the DNA seems to protect the polymerase from captan's toxic effect. A similar result occurs when DNA polymerase-$\alpha$, purified from calf thymus was tested. Captan (0.1 m$M$) inhibits polymerization by 56% however, the degree of inhibition is inversely proportional to the amount of primer units available to the enzyme. These and other data suggest a model in which the free enzyme is sensitive to captan's inhibitory action, whereas, enzyme which is bound to template DNA is unaffected by captan treatment. [Abstract 1649 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1388.** Hawkins, S. F.; Medina, M. A.; Stavinoha, W. B. (Univ. Texas Health Sci. Cent., San Antonio, TX 78284) **The acute *in vivo* effect of paraquat and diquat on intermediary metabolism in mouse lung.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 582; 1979.

The herbicides, paraquat (P) and diquat (D), had been shown to cause cellular damage as well as increased hexose monophosphate shunt activity. The present investigation using microwave irradiation (6kW at 2450 MHz for 440 msec) as a rapid means of tissue inactivation, studied the acute effects (2-24 hr) of P and D on the *in vivo* concentration of selected high energy, tricarboxylic acid cycle and glycolytic lung metabolites. Mice treated with P (25mg/kg ip) had elevated concentrations of lung ATP, calculated charge potential and microsomal ATPase activity. The lactate/pyruvate and glutamate $\alpha$-ketoglutarate ratios as well as mitochondrial succinate dehydrogenase activity were not affected by P. Administration of D (50 mg/kg ip) resulted in an increase in ATP, ADP, calculated charge potential and lactate/pyruvate ratio. There was a significant decrease in the glutamate/ $\alpha$-ketoglutarate ratio. D did not have any effect on microsomal ATPase activity. These data suggest that treatment of mice with these herbicides results in an increase in ATP synghesis to provide energy for repair of cellular damage. A decrease in the efficiency of ATP utilizing cellular components due to this cellular damage coupled with an increased ATP synthesis would further enhance the elevation of ATP. [Abstract 1871 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1389.** Chen, K. C.; Dorough, H. W. (Univ. Kentucky, Lexington, KY) **Glutathione and mercapturic acid conjugates in the metabolism of naphthalene and 1-naphthyl *N*-methylcarbamate (carbaryl).** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 585; 1979.

The formation of glutathione (GSH) conjugate in the detoxification of [1-$^{14}$C]-naphthalene and [naphthyl-$^{14}$C]- carbaryl was investigated using rat liver homogenate. The mercapturic acid conjugate in rats was also investigated by collection of urine after ip injection of $^{14}$C substrates. The formation of water-soluble metabolites *in vitro* from naphthalene was dependent on the amount of glutathione added, but this was not seen in carbaryl metabolism. *In vitro*, the metabolism of [1-$^{14}$C]- naphthalene produced 50% GSH conjugates in the incubation mixture, whereas *in vivo* the metabolism of this compound produced 65% mercapturic acid conjugate in the urine. There was no evidence of GSH or mercapturic acid conjugate in the metabolism of [naphthyl-$^{14}$C]-carbaryl *in vitro* and *in vivo*. This conclusion was made by comparing the nature and chemical characteristics of GSH and mercapturic acid conjugates formed in [1-$^{14}$C]-naphthalene metabolism. With the aid of the specific enzyme (e.g. $\beta$-glucuronidase and sulfatase) and acid hydrolysis, the water-soluble metabolites of [naphthyl-$^{14}$C]-carbaryl were tentatively recognized as glucuronide or sulfate conjugated mainly with 5,6-dihydroxy carbaryl or *N*-hydroxymethyl carbaryl and their hydrolytic products. This data demonstrated that the substituent group on the naphthalene molecule may affect the significance of GSH conjugation. [Abstract 1886 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1390.** Sprague, G. L.; Castles, T. R. (Richmond Toxicol. Lab., Stauffer Chem. Co., Richomond, CA 94804) **Paralysis development and inhibition of brain neurotoxic esterase in hens treated for 1 or 20 days with tri-*o*-cresyl phosphate.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 679; 1979.

Tri-*o*- cresyl phosphate (TOCP) was given orally to adult, White Leghorn hens according to the following schedule: Group A, 500 mg/kg/day x 1 day; Group B, 25 mg/kg/day x 20 days; Group C, 11.25 mg/kg/day x 20 days. Half the hens in Group A were killed 24 hr after the single TOCP treatment and whole brain neurotoxic esterase (NTE) activity was measured. Walking behavior and signs of toxicity in the remaining hens in Group A were monitored for 20 days after treatment. All hens in Group B and C were observed during the treatment period and killed 24 hr after the final (20th) TOCP treatment and brain NTE activities were measured in all animals. Inhibition of brain NTE activity in Groups A, B and C was not significantly different (79.1%, 74.8% and 77.3% inhibition, respectively). Both Groups A and B showed evidence of leg weakness and paralysis 13-19 days after the initial TOCP treatment. In contrast, no signs of paralysis or leg weakness were noted during the treatment period in Group C. These results suggest that although measurement of inhibition of hen brain NTE activity may predict paralysis development after acute TOCP administration, the delayed neurotoxic potential after repeated TOCP treatments may not be accurately predicted using inhibition of NTE activity. [Abstract 2378 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1391.** Holmes, L. S.; Okita, G. T. (Dep. Pharmacol., Med. Sch., Northwestern Univ., Chicago, IL 60611) **The role of Na,K-ATPase in methylmercury-induced teratogenesis.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 680; 1979.

Methylmercury (MeHg) has been shown to cause various teratogenic effects to mice exposed in utero. We have looked at the Na,K-ATPase in order to determine the mechanism of mercury caused teratogenesis in brain. We suggest that MeHg may inhibit Na,K-ATPase, thus blocking amino acid transport and causing protein deficiencies in the developing brain. Timed pregnant SVSL/129 mice were injected daily on days 7-12 of gestation with 5 mg/kg of MeHg. Fetal brains from both 19th and 16th day gestation were used. The MeHg concentrations in similar brains were 9.8 and 15.8 ppm, respectively. In order to study the inhibition of Na,K-ATPase, a $^{86}Rb^+$ tracer for $K^+$ was used. Brain cell suspensions from 19th day fetal brains were incubated with a tracer of $Rb^+$ for 20 min, and uptake of $Rb^+$ into the cell was measured. In tissue taken from the MeHg exposed fetuses, there was a 40% inhibition of $Rb^+$ uptake. In a similar cell suspension system, transport of amino acids was examined. A tracer mixture of labeled amino acids was incubated with the cell suspension from 16th day gestation fetal brains. Both amino acid transport and incorporation of amino acids into protein were significantly inhibited by exposure to MeHg. Therefore, those findings indicate that inhibition of Na,K-ATPase by MeHg may be responsible for the observed fetal brain abnormalities. [Abstract 2387 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1392.** Yasaka, W.; Sasame, H.; Saul, W.; Maling, H.; Gillette, J. R. (NIH, Bethesda, MD 20014) **Correlation between *in vivo* covalent binding and phenylbutazone-induced cytotoxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 683; 1979. (1 reference)

Previous studies (Pharmacologist *20*: 180, 1978) have shown that phenylbutazone (PBT) (150 mg/kg) causes massive hepatic necrosis in rats, especially in those that had been pretreated with both phenobarbital (PB) and diethyl maleate (DEM). Since those findings suggested that the hepatic necrosis was caused by a chemically reactive metabolite we studied the relationship, the severity of PBT-induced cytotoxicity and in *in vivo* covalent binding (CB) of $^{14}C$-PBT. The hepatic CB of $^{14}C$-PBT in saline rats was about the same extent as in 3-methylcholanthrene (3MC). However, the hepatic lesion was absent in 3MC rats and rare in untreated rats. In contrast, PB pretreatment caused a 50% increase in the CB of $^{14}C$-PBT mainly in the cytosol and microsomal fractions and a 6-fold increase in the toxicity index. Prior administration of piperonyl butoxide decreased significantly the CB of $^{14}C$-PBT to liver in all groups of rats and prevented the necrosis in PB=induced rats. However, the prior administration of DEM increased significantly the CB and the severity of necrosis in PB-treated rats, but had little effect in saline or 3MC-treated rats. These observations support the view that the hepatic necrosis was caused by a chemically reactive metabolite of PBT. [Abstract 2403 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1393.** Davis, M. E.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Biochemical and functional effects of chlordecone and its enhancement of carbon tetrachloride toxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 683; 1979.

Preexposure to chlordecone (CD, Kepone) has been shown to markedly enhance the toxicity of halomethanes. In the present studies, the nature of this effect was examined. Male rats were pretreated with CD (5 mg/kg, po) or vehicle (V) and 48 hr later treated with $CCl_4$ (0.2 ml/kg, ip) or V for 24 hr unless noted. Bile flow and biliary excretion of polar metabolites of imipramine (PMIMP) were both decreased (by 19% and 88%) and urinary excretion was doubled in the CD + $CCl_4$ group, compared to CD + V. The CD + V group was not different from V alone and $CCl_4$ (1 ml/kg) alone produced only a 28% decrease of PMIMP excretion in bile and no effect on bile flow. Plasma bilirubin was increased and hepatic and renal protein contents were decreased in the CD + $CCl_4$ group but were unaffected by either CD + V or V + $CCl_4$. Blood urea nitrogen, and hepatic and renal glutathione (GSH) levels were unaffected by CD at 6 hrs, 1, 2, 5 and 7 days after treatment, by CD + V, by V + $CCl_4$ or by CD + $CCl_4$. Pentobarbital (40 mg/kg) sleeping time was unaf-

fected by CD + V (69.0 ± 5.6 min), was increased by V + $CCl_4$ (138.7 ± 2.9 min.) and was increased by CD + $CCl_4$ (277.5 ± 16 min). Irreversible binding of a tracer dose of $^{14}CCl_4$ was not different in CD and V pretreated groups. The dramatic enhancement of $CCL_4$ hepatotoxicity by CD is not due to depletion of GSH or increased binding of $CCl_4$. [Abstract 2404 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1394.** Kunze, K. L.; Oritz de Montellano, P. R.; Yost, G. S. (Dep. Pharmaceut. Chem., Sch. Pharm., Univ. California, San Francisco, CA 94143) **The mechanism of cytochrome P450 destruction by acetylenic compounds.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 691; 1979.

Hepatic Cytochrome P450 levels are reduced upon the administration to phenobarbital induced rats of a number of acetylenic compounds (50-100 mg/kg, ip), including the contraceptive steroid Norethindrone, insecticide synergists such as para nitro phenyl propargyl ether, 1-ethynl cyclopentanol, and 4-phenyl-1-butyne. The reduction in enzyme levels is marked by the appearance of pigments which, upon acidic methylation and subsequent purification, have UV-visible absorption spectra ($\gamma$ max 417, 512, 546, 590, 646) characteristics of porphyrin compounds. These pigments have been shown to be the product of covalent association bteween the administered compounds and Protoporphyrin IX derived from the prosthetic group of P450. Field Desorption Mass Spectrometry performed on these pigments gives molecular weights corresponding to the sum of the dimethyl ester of Protoporphyrin IX plus the destructive agent plus 16. These results strongly suggest that the attempted metabolism of these compounds by P450 results in the production of a reactive, suicidal species which binds to the porphyrin ring rendering the enzyme catalytically inactive. [Abstract 2448 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1395.** Reiser, K. M.; Greenberg, D. B.; Last, J. A. (Univ. California, Davis, CA 95616) **Type I/Type III collagen ratios in lungs of rats with experimental pulmonary fibrosis.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 817; 1979.

Rats exposed to high levels of ozone (1.5 ppm for 6 days) or to paraquat (24 mg/kg, injected ip six days previously) show an increased rate of collagen biosynthesis in their lungs (as measured with lung minces *in vitro*) and an acute onset of pulmonary fibrosis, which is demonstrable histopathologically within six days. These models allow one to examine whether the ratio of collagen types being synthesized during the period of pneumotoxin-induced enhanced synthesis of collagen in the lungs is different than the normal ratio (60-65% Type I: 30-35% Type III). We quantitated the types of newly synthesized collagen extracted from rat lung minces after labeling with [$^3$H]proline. Pepsin-solubilized collagen has been quantitated after separation on SDS-polyacrylamide gels and on carboxymethylcellulose (CMC) columns. Total labeled (soluble plus insoluble) collagen was analyzed by fragmentation with CNBr followed by CMC chromatography and SDS gel electrophoresis of the peaks. Peptides separated by electrophoresis were quantitated by liquid scintillation counting of appropriate bands, correcting the radioactivity for the relative amounts of proline and hydroxyproline in the peptides. We conclude that the ratio of Type I to Type III collagen is not altered when newly synthesized collagen is evaluated from rats treated with either paraquat or ozone. [Abstract 3088 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1396.** Huang, D. T. P.; Ho, I. K.; Mehendale, H. M.; Hume, A. S. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Neurotoxicity induced by oral administration of Kepone (chlordecone) in the mouse.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 845; 1979.

Neurotoxicity in the mouse was produced following daily oral administration of 10, 25 and 50 mg/kg of Kepone (chlordecone) dissolved in corn oil. Hyperexcitability and tremors were observed at 1, 4, and 9 days after the administration of Kepone at 50, 25 and 10 mg/kg, respectively. Mortality occurred on the 5th, 7th and 13th day after daily administration of Kepone, repectively. The results also suggested that in mice treated with different doses of Kepone cumulative LD50 is between 180 and 200 mg/kg of Kepone. Daily oral administration of Kepone caused loss of body weight. At the onset of tremor, the loss of body weight was greatest. However, in terms of food and water consumption the effect of Kepone varied depending on the dose. Upon the termination of Kepone treatment, a recovery in body weight, and food and water consumption were observed. The study also showed that the effect on Kepone on motor coordination in the mouse was also dose-dependent. The recovery of motor coordination after the termination of Kepone administration was also dose-dependent. The threshold for pentylenetetrazol induced seizures was significantly reduced compared to that of the corn oil vehicle administered mice. This study has provided essential basic information for studying the biochemical mechanisms of Kepone induced neurotoxicity. [Abstract 3235 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1397.** Curtis, L. R.; Thureson-Klein, A. K.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Specificity of Kepone-induced potentiation of carbon tetrachloride hepatotoxicity: comparison with mirex and photomirex.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 845; 1979.

Ultrastructural, biochemical and functional parameters were investigated following treatment with 3 chlorocarbon analogs, carbon tetrachloride ($CCl_4$) and combinations of said chemicals. Proliferation of hepatic smooth endoplasmic reticulum (SER) occurred following preexposure of male rats to 10 ppm mirex (M), photomirex (PM) and Kepone (chlordecone, K) in the diet for 15 days. PM produced whorls of membranes composed of SER at one end and rough endoplasmic reticulum (RER) at the other. At 24 hr following $CCl_4$ (0.05 ml/kg) condensed mitochrondria, increased SEM,

swollen membranes and lipid vacuoles were evident. A combination of $CCl_4$ and K resulted in severe disruption of ultrastructure: mitochondria with swollen cristae, dispersed RER, lipid droplets and chromatin accumulation in nuclei were common. M and PM plus $CCl_4$ did not result in marked changes from those seen with $CCl_4$ alone. Measurement of serum GOT, GPT and OCT provided biochemical support for the morphological observations. These enzymes were increased in excess of 10 fold following the K/$CCl_4$ interaction. The biliary excretion of phenol- 3,6-dibromo phthalein (DBSP) was also studied. Suppression of hepatobiliary excretion of DBSP and bile secretion was found only in those animals subjected to K/$CCl_4$. [Abstract 3236 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1398.** Ford, R. D.; Rosenblum, I. (Cent. Exp. Pathol. Toxicol., Albany Med. Coll., Albany, NY 12208) **Behavioral effects of diisopropyl fluorophosphate (DFP) in adult chickens.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 845; 1979.

The acute and delayed behavioral effects of single oral doses of DFP (0.125-1.0 mg/kg) were studied in White-Leghorn hens trained to key-peck under a multiple fixed-ratio, fixed-interval (mult FR FI) schedule of food presentation. Starting 90 min after administration, effects were assessed in daily 1 hr sessions. Acute effects, restricted to the first session, consisted of dose-related response-rate decreases which were similar for both FR and FI schedule components. In addition, the temporal pattern of FI responding was altered so that high control response-rates within the interval were decreased and low control response-rates were increased. Following a return to control responding for no less than 7 days, delayed effects occurred. Delayed behavioral effects, consisting of one or more sessions where both FR and FI responding were decreased, preceded neurotoxic effects. These latter effects first appeared as ataxia and progressed to leg paralysis and sometimes death. Delayed effects followed both acutely active doses (0.5-1.0 mg/kg), as well as doses (0.125-0.25 mg/kg) having no or little acute behavioral effects. [Abstract 3237 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1399.** End, D. W.; Carchman, R. A.; Dewey, W. L. (Dep. Pharmacol., Med. Coll., Virginia, Richmond, VA 23298) **Disruption of rat brain synaptosomal membranes by the neurotoxic insecticide Kepone.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 845; 1979. (1 reference)

Previously, we reported that the neurotoxic organochlorine insecticide Kepone (chlordecone) inhibited brain mitochondrial $Ca^{++}$ sequestration thus impairing synaptosomal $Ca^{++}$ uptake while stimulating the release of neurotransmitters (Pharmacologist *20*, 188, 1978). We have recently uncovered a direct, membrane disrupting effect of Kepone at high *in vitro* concentrations (10 $\mu M$). Both the mitochondrial poison KCN (1 m*M*) and Kepone (10 $\mu M$) stimulated the efflux of $Ca^{++}$ from synaptosomes, an effect which was linked to the liberation of mitochondrial $Ca^{++}$ stores. While KCN induced $Ca^{++}$ efflux proceeded via $Na^{+}$-$Ca^{++}$ exchange across the synaptosomal plasma membrane, Kepone induced efflux proceeded independently of either $Na^{+}$-$Ca^{++}$ or $Ca^{++}$-$Ca^{++}$ exchange indicating that the synaptosomal plasma membrane integrity was compromised by Kepone. While both Kepone and KCN liberated LDH from synaptosomes, scanning electron microscopy revealed that Kepone poisoned synaptosomes underwent lysis while cyanide poisoned synaptosomes sustained minor swelling. [Abstract 3228 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1400.** Moody, D. E.; Smuckler, E. A. (Univ. California, San Francisco, CA 94143) **Decrease in hepatic microsomal cytochrome P450 and $b_5$ after treatment with 1,2-dibromo- 3-chloropropane (DBCP). Effect on synthesis of protein and heme moieties.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 845; 1979.

Administration of a single oral dose of DBCP (dibromochloropropane) to male rats results in a decrease of the hepatic content of microsomal cytochrome P450 and $b_5$. This decrease was apparent by 12 hr and maximal at 48 hr. The 48 hr time content of P450 and $b_5$ are 45 and 65% of controls respectively. No significant change was noted in the uptake of $^{3}$H-leucine or $^{14}$C-orotic acid into the precipitable liver protein or RNA of animals treated for 12 hr. The incorporation of $^{14}$C-labeled δ-aminolevulinic acid into the precipitable liver protein, microsomes and protease-treated microsomes was decreased 88, 65, and 70% of respective control value in animals treated for 12 hr. The activity of ALA-dehydratase was decreased to 75 and 90% of controls at 24 and 48 hr. No significant changes were noted in the activities of ALA-synthetase or uroporphyrinogen-I-synthetase at these times. These data suggest an inhibition of heme synthesis or an alteration in heme degradation may play a role in the decrease of the microsomal cytochromes following treatment with DBCP. [Abstract 3240 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1401.** Dougherty, K. K.; Byard, J. L. (Univ. California, Davis, CA 95616) **Induction of mixed function oxidase by phenobarbital, hormones, and serum in primary cultures of mouse hepatocytes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 846; 1979.

Primary hepatocyte cultures have been developed as a model system to investigate the induction of mixed function oxidase (MFO). Hepatocytes were isolated from Charles River CD-1 male mice and cultured in modified Waymouth's 752/1 medium. Hepatocytes maintained in culture for 24 or 48 hr were able to *N*-demethylate *p*-chloro-*N*- methylaniline (PCMA). *N*-demethylation was inhibited by carbon monoxide. Baseline activity of *N*-demethylation and cytochrome P450 levels decreased with time in culture. PCMA *N*-demethylation and cytochrome P450 were increased by the addition of hormones or calf serum to the medium. Phenobarbital, added to the culture medium, stimulated *N*-demethylation in

a dose-dependent manner. A 40% stimulation occurred at 1 m*M* and a 60% stimulation occurred at 2 m*M*; however, no increase was observed at 10 m*M*. Phenobarbital did not stimulate *N*-demethylation in hepatocytes cultured without serum. The chlorinated hydrocarbon, mirex, was taken up by hepatocytes, but did not cause an increase in *N*-demethylation with or without serum. Although primary mouse hepatocyte cultures are responsive to induction of MFO by hormones, serum, and phenobarbital, for some unknown reason(s) they do not respond to mirex, a known inducer of MFO *in vivo*. [Abstract 3242 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1402.** Davison, K. L.; Lamoureux, C. H.; Picard, J. M. (Metab. & Radiat. Res. Lab., Agric. Res., USDA, Fargo, ND 58105) **Distribution, metabolism, and elimination of $^{14}$C-methoxychlor in orally dosed goats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 868; 1979.

Methoxychlor is an insecticide used to control flies in farm buildings and on livestock. [Ring-$^{14}$C] *p,p'*-methoxychlor was given in gelatin capsules to two lactating goats. Goat 66 was given 1 g of *p,p'*-methoxychlor (582 $\mu$Ci), and goat 69 was given 200 mg of *p,p'*-methoxychor (545 $\mu$Ci). When the goats were killed 3 days later, recovery of the $^{14}$C in milk, urine, feces, GI tract and carcass for goat 66 was 0.06, 27, 65, 2, and 0.3%, respectively, and for goat 69 was < 0.01, 58, 40, 0.3, and 0.1%, respectively. For both goats, about 3% of the $^{14}$C in lyophilized feces extracted with hexane, and nine metabolites were identified in this extract from goat 66. About 70% of the $^{14}$C in feces extracted with methanol after hexane extraction. Metabolites in the methanol extract of feces and in urine are being identified. [Abstract 3368 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1403.** Evers, W. D.; Hook, J. B.; Bond, J. T. (Michigan State Univ., East Lansing, MI 48824) **Feeding a purified diet alters the toxicity of paraquat and carbon tetrachloride in mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 868; 1979. (1 reference)

Male mice fed a purified diet (PD) were more sensitive to the herbicide, paraquat (PQ), than mice fed a closed-formula diet (CFD), Wayne Lab Blox (The Pharmacol., 20, 178). This experiment examined additional diet-PQ interactions as well as differences in carbon tetrachloride ($CCl_4$) toxicity. Mice fed CFD or PD were given a single ip injection of PQ (26 mg/kg). A greater sensitivity to PQ, shown by shorter survival time and lower percent survival, was observed after feeding for only 3 days or for as long as 8 wk, and occurred in both sexes. At the same PQ dose, ICR and B6C3F1 mice gave a similar diet-PQ response while C57BL6J mice showed an increased sensitivity to PQ which was not altered by diet. Renal toxicity to PQ as measured by organic ion accumulation in renal cortical slices was also altered by feeding PD. After an ip injection of $CCl_4$ (2 ml/mg) survival time and percent survival were less in mice fed PD. Hepatic glucose-6-phosphatase activity, as an indicator of $CCl_4$ toxicity, was altered by diet, while the renal enzyme was not changed. Glutathione concentrations in the liver and kidney were not altered by diet-$CCl_4$ interaction. These results suggest that dietary alteration of PQ toxicity by feeding PD occurs soon after the diet is fed, is sustained, and may show strain differences. Survival after $CCl_4$ is changed and may involve diet-induced alterations in hepatic metabolism. [Abstract 3369 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1404.** Chou, K.; Cook, R. M. (Dep. Dairy Sci., Michigan State Univ., East Lansing, MI 48824) **The effects of pentachlorophenol on fetal and postpartum development in the rat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 868; 1979.

Pentachlorophenol (PCP) is widely used as an antifungal agent. There is a paucity of data on the effects of PCP on reproduction. Experiments were carried out to determine the effects of pure PCP and industrial composite of PCP on reproduction in rats. Dose levels of 0, 0.4, 4 or 40 mg/kg of technical grade pentachlorophenol and the purified pentachlorophenol adjusted to provide the same levels of PCP were administered ip to pregnant Sprague-Dawley rats on days 3, 6, 9, 12 and 15 of gestation. The carrier vehicle was corn oil. Animals treated with the highest levels of either chemical showed lower maternal body weight gain and higher incidence of fetal resorptions compared to the controls. Purified PCP had more effects on the body weight gain and fetal resorption than the technical grade PCP. Feed intake was not affected by the treatments. The performance of the pups from the rats treated with PCP was also studied. Studies of the lactation index, feed intake, growth rate and reproduction of the offspring showed no differences between controls and treated animals. Studies of the activity of hepatic pyruvate kinase from both the dam and the offspring showed no significant differences between control and PCP treated rats. Also, pentachlorophenol was not teratogenic. This experiment suggest that PCP in the environment does not present a serious hazard to the reproductive process in animals. [Abstract 3371 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1405.** Lau, Y. T.; Lang, M. A.; Essig, A. (Sch. Med., Boston Univ., Boston, MA 02118) **Effects of rotenone and antidiuretic hormone (ADH) on transport energetics.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 2): 1057; 1979.

Rates of active sodium transport (*Ja/Na*) and suprabasal oxygen consumption (*Jsb/r*) were measured simultaneously in frog skins exposed to symmetrical Na Ringer's solutions, and the results were analyzed according to linear non-equilibrium thermodynamics: $Ja/Na = LNa\ (-F\Delta\Psi) + LNa,r\ A$ and $Jsb/r = LNa,r\ (-F\Delta\Psi) + Lr\ A$. Here $\Delta\Psi$ is the electrical potential differences across the skin, the L's are phenomenological (kinetic) coefficients, and A is the affinity (negative Gibbs free energy) of the metabolic driving reaction. The metabolic inhibitor rotenone (5-10 $\mu M$) was found to inhibit both *Ja/Na* and *Jsb/r* to the same extent (approxi-

mately 50%), both in the presence and absence of aldosterone. There was no significant effect on A, but the L's were all depressed. ADH (0.1 U/ml) stimulated both *Ja/Na* and *Jsb/r* to twice control level, with stability for several hours. A, *LNa,r,* and *LNa* were all increased, while *Lr* remained unchanged. With rotenone-treated skins, ADH stimulated *J a/Na* to the same extent initially as in controls (without rotenone), but the full ADH effect was not sustained. [Abstract 4391 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1406.** Austin, G. E.; Moyer, G. H. (Pathol. Dep., Univ. California, Los Angeles, CA 90024) **Hepatic RNA synthesis in rats treated with ethylene thiourea.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 2): 1404; 1979.

Ethylene thiourea (ETU) is the major degradation product of the ethylene *bis* dithiocarbamate fungicides which are used on agricultural crops. This compound has been reported to produce tumors of thyroid and liver after prolonged administration to rats or mice. However, *in vitro* testing has indicated that the compound is not mutagenic, suggesting that ETU may not be an initiator of carcinogenesis. Another property we have found to be common to most and possibly all carcinogens is the ability to inhibit transcription. Thus, we have examined the effect of ETU administered to rats by ip injection, by nasogastric tube or in the diet. Even doses which produced extreme clinical toxicity and marked depression of serum thyroxin levels brought about no reduction in the rate of nuclear or cytoplasmic RNA synthesis. By contrast, the structurally related weak hepatocarcinogen, thioacetamide, at comparable doses, did inhibit liver RNA synthesis as did the potent hepatocarcinogen, N-2 acetylaminofluorene. These results support the suggestion that ETU is not a direct-acting carcinogen but that it increases tumor incidence by an indirect mechanism, possibly involving its antithyroid properties. [Abstract 6205 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1407.** Ruebner, B. H.; Gershwin, M. E.; Hsieh, L.; Dunn, P. (Sch. Med., Univ. California, Davis, CA 95616) **Ultrastructure of spontaneous hepatic neoplasms and of neoplasms induced by diethylnitrosamine or dieldrin in the $C_3H$ mouse.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 2): 1451; 1979.

The hepatocellular neoplasms which developed in $C_3$ H (MTV-ve) male mice are described with particular reference to ultrastructure. No morphologic differences could be detected between the spontaneous and induced lesions. However, the animals given diethylnitrosamine or dieldrin developed the lesions earlier, in greater numbers and of large size. The earliest change was the development of foci composed of clear cells. These nodules were followed by basophilic nodules with focal trabecular hepatocellular carcinomas. Ultrastructurally, the clear cells had increased glycogen and lipid droplets and decreased smooth endoplasmic reticulum. The basophilic cells resembled the clear cells except for having a greatly increased rough endoplasmic reticulum. Cells of trabecular areas differed from those of benign nodules in the greater secretory activity of the rough endoplasmic reticulum, in the development of basement membranes at the vascular pole and of microvilli along the lateral cell membranes. It is postulated that, in this series, the first morphologic step in the neoplastic transformation is the appearance of unusually clear hepatocytes and that basophilic hepatocytes represent a later step in the progression towards hepatocellular carcinoma. The role of the smooth endoplasmic reticulum in this transformation will be discussed. [Abstract 6457 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1408.** Daughton, C. G.; Cook, A. M.; Alexander, M. (Lab. Soil Microbiol., Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Biodegradation of phosphonate toxicants yields methane or ethane on cleavage of the C-P bond.** *FEMS Microbiol. Lett.* 5(2): 91-93; 1979. (11 references)

Evidence is given of the biodegradation of the C-P bond of synthetic alkylphosphonates by enzymatic cleavage, and the new pathway for the formation of alkanes via this aerobic cleavage is examined. Cultures of *Pseudomonas testosteroni* incubated with liquid medium containing a phosphorus source were analyzed for vile headspace production of alkanes by gas chromatography with an FID detector and a subambient accessory. Identification of the compounds was achieved by mass spectrometry. A list of yields of the alkanes produced from the biodegradation of various alkylphosphonates by *P. testosteroni* is given. No methane was produced during or after the growth of *P. testosteroni* on other alkylheteroatom compounds when ethylphosphonate was used as a phosphorus source. Methylmercury chloride inhibited culture growth completely and stopped the enzymatic release of ethane. These results suggest that the enzyme is highly specific for the C-P bond, and the alkylphosphonates derived from insecticides, fungicides, herbicides, flame retardants, and ore flotation promoters may be mineralized in nature.

**79-1409.** Matsuura, N.; Takinami, M.; Kurisaki, E.; Satoo, H. (Sch. Int. Med., Fukushima Med. Coll., Fukushima, Japan) **[Distribution of paraquat dichloride and diquat dibromide in the living body.]** *Fukushima Igakkai Zasshi (Fukushima Med. J.)* 28(3-4): 212; 1978. (Japanese)

Paraquat dichloride and diquat dibromide were administered separately to rats at their LD50 values orally. After 2 or 24 hr post administration, specimens of blood, brain, heart, lungs, liver, kidneys, stomach content, and intestine were examined for levels of the herbicides. Rats died 4 to 5 days after paraquat administration and 3 to 4 days after diquat administration. In the lungs of rats that received paraquat, a strong stagnation was observed with an image of pneumonia. In rats given diquat, an inflated digestive tract and greenish colored ileum were noted. Concentration of the herbicidal residues were remarkably higher in lungs, liver, and kidney than in other organs. The concentrations of paraquat after 24 hr were higher than those observed after 2 hr

post administration. The ratio of the concentrations at 24 and at 2 hr were the highest in the lungs. In the case of diquat, the residue values at 2 hr were higher than those at 24 hr. These results show that diquat is absorbed to a lesser degree and is more easily excreted than paraquat.

**79-1410.** Blevins, R. D.; Sholes, T. E. (East Tennessee State Univ., Johnson City, TN 37601) **Response of HeLa cells to selected pesticides and hallucinogens.** *Growth* 42(4): 478-485; 1978. (14 references)

The effects of five liquid commercial insecticides, Raid, Isotox (BHC), Sevin (Carbaryl), ortho-Klor 74 (chlordane), and Malathion 50, and two halucinogenic compounds, d-lysergic acid diethylamide (LSD) and Δ-9-tetrahydrocannabinol (Δ-9-THC) on monolayer cultures of HeLa cells were studied. The HeLa cells were incubated for 48 hr with varying concentrations of the test compounds and the effect on cell growth was observed. Ortho-Klor caused 100.0% inhibition of cell growth at levels of 0.015 μl of liquid formation/ml of concentrations of Raid, Isotox, and Malathion 50 were in the incubation mixture. Sevin also enhanced cell growth at concentrations of 1.5 μl/ml, but had no effect on cell numbers at 0.015 μl/ml. No increase in cell numbers was achieved by addition of either hallucinogenic compound to the cell cultures. Cell numbers decreased as the levels of LSD and Δ -9-THC increased. The concentration of each compound that caused the least toxicity to the HeLa cells was than used to monitor the effect of each substance on TCA (trichloroacetic acid) precipitable nucleic acids and protein after a 48 hr incubation period with the proper radioactive precursor. RNA, DNA, and protein of the HeLa cells increased when Raid, Isotox, and Malathion 50 were applied at 0.015 μl/ml and when Sevin was applied at 1.5 μl/ml. The protein and nucleic acids were decreased after incubation of the HeLa cells with 7.5 μg/ml of LSD and 1.0 μg/ml of Δ-9-THC.

**79-1411.** Luderschmidt, Chr. (Dermatol. Univ.-Klin., D-8000 Munich 2, BDR) **Behandlung der Skabies waehrend der Schwangerschaft. [Treatment of scabies during pregnancy.]** *Hautarzt* 30(2): 114-115; 1979. (3 references) (German)

Jacutin (a lindane preparation) is contraindicted in the treatment of scabies during pregnancy due to its possible teratogenic effect. Lindane was found to pass through the placental barrier and into the fetal blood in small amounts. Animal experiments covering several generations have failed to demonstrate the mutagenic and teratogenic effect of lindane, nor has any teratogenic effect been observed in the children of mothers who were exposed to this substance during pregnancy. Due to its high liposolubility, lindane is persistent in fatty tissue, and is excreted in mother's milk. Lindane treatment of infants and small children with scabies can cause poisoning due to resorption.

**79-1412.** Patil, T. N.; Radhakrishnamurty, R.* (Discipline Biochem. & Appl. Nutr., Cent. Food Technol. Res. Inst., Mysore 570013, India) **Effect of alpha-naphthylthiourea on ($Na^+$ + $K^+$)-ATPases in albino rats.** *Indian J. Biochem. Biophys.* 15(4): 294-298; 1978. (29 references)

A study was undertaken to determine the effects of α-naphthylthiourea (ANTU), a specific acute rodenticide, on ATPases in different tissues. Female Wistar rats were given oral doses of ANTU (10 mg/kg). Erythrocyte membrane, liver microsomes, and kidney microsomes were assayed for ($Na^+$ + $K^+$)-ATPases. Inhibition of ($Na^+$ + $K^+$)-ATPases occurred in erythrocyte membranes and kidney microsomes. There were no effects observed with ATPases activated by 2,4-dinitrophenol, magnesium or calcium from liver and kidney mitochondria. There was substantial reversal of inhibition by phosphatidyl choline, phosphatidyl ethanolamine, and adenosine triphosphate.

**79-1413.** Ramakrishna, N.; Ramachandran, B. V. (Indian Drug Res., Lab., Poona 411005, India) **Mode of action of toxogonin in the protection of mice against certain organophosphorous insecticides.** *Indian J. Biochem. Biophys.* 15(4): 336-337; 1978. (13 references)

In a study of the protective effects of toxogonin, albino mice were given ip injections of four organophosphorus insecticides (parathion, methyl parathion, paraoxon and EPN) in submultiples and multiples of their LD50's. The LD50's determined were (in mg/kg): parathion, 5.6; paraoxon, 1.3; methyl parathion 21.0; and EPN, 8.4. After sacrifice at 18 hr post-dosing, the acetylcholinesterase activity of brain tissue was found to be inhibited. Pretreatment with toxogonin had no effect in protecting or reactivating brain acetylcholinesterase.

**79-1414.** Dalela, R. C.; Bhatnagar, M. C.; Verma, S. R. (Pollut. Relevant Res. Lab., Dep. Zool., DAV (PG) Coll., Muzaffarnagar 251001, India) **Histochemical studies on the effect of rogor and thiodon on the activity of acid phosphatase in liver, muscules and kidney of *Channa gachua*.** *Indian J. Exp. Biol.* 16(10): 1099-1102; 1978. (10 references)

Mature, healthy and active specimens of *Channa gachua* were exposed to either a 0.01176 mg/l solution of thiodon (endosulfan) or a 6.2 mg/l solution of rogor (dimethoate). Both of these solutions proved toxic within 2 to 5 hr. Other fish were then immersed in either a 0.0035 mg/l solution of thiodon or a 1.491 mg/l solution of rogor. At tissue examination 10 days later it was noted that the activity of acid phosphatase decreased in the liver, muscules, and kidney particularly due to thiodon exposure, which is the more toxic compound. This may be due to the uncoupling of phosphorylation after intoxication with the chemicals. After the earlier experimental exposure, in which the fish died, an increased activity of acid phosphatase was noted in the liver, muscules, and kidney which may be due to rupturing of the lysosomal and cellular membranes.

**79-1415.** McKiernan, P.; Doyle, D. A.; Duffy, G. J.; Towers, R. P.; Duff, F. A.; O'Donovan, D. K. (St. Vincent's

Hosp., Elm Park, Dublin 4, Ireland) **Brief report. *o,p'*-DDD and adrenal carcinoma.** *Ir. J. Med. Sci.* 147(12): 437-440; 1978. (9 references)

A case study of a 58-yr-old woman with a history of pyelonephritis and a right hydronephrosis who developed adrenal cortical neoplasia is described. An adrenal tumor of the right kidney was removed from the patient in 1971. In 1974 the patient complained of hirsutism which had been in remission since an earlier diagnosis but was not connected with Cushing's Syndrome. Hepatic scan by $I^{131}$-19 iodocholesterol showed a large metastatic lesion which was treated by *o,p'*-DDD (TDE). Laparatomy was performed again in 1974 when metastases of the tumor were found near the liver. A right nephrectomy was called for and *o,p'*-DDD therapy was reinstated. Regression of the metastases behind the liver was confirmed by an $I^{131}$-19 iodocholesterol scan. The *o,p'*-DDD treatment was again stopped due to severe nausea, and a reoccurrence of the hirsutism and metastases behind the liver followed. The *o,p'*-DDD therapy was restarted in 1976, and by 1977, the liver metastases had diminished in size. The patients long survival is attributed to the biological variation in the carcinoma or to increased sensitivity of the tumor to the drug. Also the $I^{131}$-19 iodocholesterol procedures used may have contributed a beneficial effect by affording 6 mCi of $I^{131}$ in each scan which was repeated three times. It is theorized that this large dose of radiation could have sensitized the tumor to the adrenolytic effect of *o,p'*-DDD.

**79-1416.** Young, R., Jr.; Hass, D. K.; Brown, L. J. (Shell Dev. Co., Modesto, CA 95352) **Effect of late gestation feeding of dichlorvos in non-parasitized and parasitized sows.** *J. Anim. Sci.* 48(1): 45-51; 1979. (32 references)

Sows were exposed to dichlorvos at 4 mg/kg body weight/day from gestation day 80 until parturition. Sows treated with dichlorvos produced 0.5 more live pigs than sows not treated. The mean birth weight of piglets from dichlorvos-treated sows was 0.06 kg heavier than that of controls. The litter birth weight was 1.3 kg heavier in treated sows. Individual pig weaning weight was 0.5 kg greater among piglets from treated sows. These data confirm earlier beliefs that dichlorvos improves reproductive performance in sows independently of parasitism.

**79-1417.** Juneja, S.; Dogra, R. C. (Dep. Microbiol., Haryana Agric. Univ., Hissar 125004, India) **Effect of aldrin on growth and oxidative metabolism of rhizobia.** *J. Appl. Bacteriol.* 44(1): 107-115; 1978. (23 references)

Rhizobia of the *Rhizobium* sp. Bengal gram and Green gram exposed to aldrin at 500 μg/ml demonstrated a lag of about 12 hr in their growth patterns, followed by a slow growth rate up to 24 hr, after which growth rate returned to normal. Higher concentrations extended this lag period with the organism multipying at a very slow rate. At concentrations of aldrin of 1000, 1500, and 2000 μg/ml, the growth inhibition after 168 hr of incubation was 72, 81, and 84%, respectively. Growth of *Rhizobium* sp, Green gram experienced a lag of 12 hr at 500 μg/ml aldrin, with lag times increasing over higher concentrations. Aldrin at 150 μg/ml strongly inhibited the rate of oxidation of pentoses by *Rhizobium* sp. Bengal gram and *Rhizobium* sp. Green gram. Aldrin also inhibited the oxidation of hexoses. A high concentration of glucose partially released the inhibitory effect of aldrin on the oxidative activity of rhizobia.

**79-1418.** Reuber, M. D. (Chem. Carcinog. Program, NCI Frederick Cancer Res. Cent., Frederick, MD 21701) **Interstitial cell carcinomas of the testis in Balb/c male mice ingesting methoxychlor.** *J. Cancer Res. Clin. Oncol.* 93(2): 173-179; 1979. (30 references)

Starting at three wk of age, mice of the Balb/c and C3H strains were fed 750 ppm technical methoxychlor or 100 ppm technical DDT in their laboratory meal for a period lasting up to 2 yr. The Balb/c mice receiving methoxychlor survived an average of 89.8 wk while those ingesting DDT survived an average of 79.4 wk. Controls lived 93.8 wk. Mice in the C3H strain survived 101.4 wk while those of this strain fed methoxychlor survived 97.5 wk and those receiving DDT, 99.1 wk. Carcinomas of the testis were noted in male Balb/c mice receiving methoxychlor, and these were more frequent in number and in malignancy than in controls. Testicular tumors were not noted in C3H mice receiving either chemical, nor in Balb/c mice receiving DDT. It is suggested that the carcinogenicity was related to the estrogenic activity of methoxychlor.

**79-1419.** Reuber, M. D. (NCI Frederick Cancer Res. Cent., Frederick, MD 21701) **The carcinogenicity of Kepone.** *J. Environ. Pathol. Toxicol.* 2(3): 671-686; 1979. (7 references)

Results of studies at the Natl. Cancer Inst. (NCI) and at the Medical College of Virginia on the carcinogenicity of Kepone (chlordecone) are reviewed. Survival times of both male and female rats and mice were reduced after ingesting low and high doses of the pesticide for 80 wk. Significant increases in liver tumor incidences of female rats were noted in the NCI study following the low and high dose feeding program. The lesions included hyperplastic nodules, carcinomas, and sarcomas. The incidence of malignant tumors, carcinomas, and sarcomas was also significantly increased in organs other than the liver in high-doses males and females, and in low-dosed male rats. Both male and female mice ingesting low (20 ppm) or high (40 ppm) doses of Kepone developed significantly higher incidences of hepatocellular carcinomas than the controls. Males were more susceptible than females, and carcinomas developed in a dose-related manner. There were also toxic changes, particularly in male rats, associated with Kepone. These lesions included interstitial fibrosis of the kidney, polyarteritis of the mesenteric and pancreatic arteries, and atrophy of the testes.

**79-1420.** Copeland, M. F.; Chadwick, R. W. (Environ. Res. Cent., US EPA, Research Triangle Park, NC) **Bioisomerization of lindane in rats.** *J. Environ. Pathol. Toxicol.* 2(3): 737-749; 1979. (15 references)

Weanling female Sprague-Dawley rats received 0, 130, 215, or 350 ppm γ-HCH (γ-hexachlorocyclohexane, lindane) in their diet. Six animals from each treatment group were sacrificed at 1, 2, 4, 8, 16, and 24 wk after exposure. One day before decapitation all animals received a single oral dose of 2.13 mg or 1.88 mg γ-HCH in peanut oil. No significant differences in food consumption, body wt, or mortality were noted throughout the study. The anaerobic conversion of γ-HCH to γ-3,4,5,6-tetrachlorocyclohexene via the dechlorinase enzyme were significantly higher in treated animals than in controls. The liver body wt ratios of rats fed 215 and 350 ppm lindane were significantly higher ($p < 0.05$) at all times except at 4 wk after treatment. A highly significant positive correlation between the amount of lindane in the diet and hepatic content of α-HCH ($r = 0.99$) or γ-HCH ($r = 0.90$) was noted. There was a negative correlation ($r = 0.71$) between the amount of lindane and hepatic content of δ -HCH, and between the hepatic content of α-HCH ($r = 0.73$) and γ-HCH ($r = 0.86$) and the duration of treatment. Bioisomerization does not appear to play a significant role in the metabolism of lindane by rats.

**79-1421.** Kavlock, R.; Chernoff, N.; Baron, R.; Linder, R.; Rogers, E.; Carver, B.; Dilley, J.; Simmon, V. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC) **Toxicity studies with decamethrin, a synthetic pyrethroid insecticide.** *J. Environ. Pathol. Toxicol.* 2(3): 751-765; 1979. (12 references)

Adult male and female, and weanling female Sherman rats were used in acute oral (5 mg/kg by gavage), intravenous (0.313 ml/kg tail vein), and dermal (3.2 ml/kg on back) decamethrin toxicity studies. Adult females were more sensitive to the oral dosing (LD50 31 mg/kg) than adult males (LD50 52 mg/kg); in weanling females LD50 values (50 mg/kg) were comparable to adult males. With cutaneous administration, absorption of decamethrin appeared to be negligible, since 800 mg/kg applied to the skin failed to induce toxicity. Inhalation studies showed that the LD50 values via this route were 36 mg/kg for adult males and 28 mg/kg for adult females. Clinical signs of toxicity were similar for all routes of exposure. Developmental toxicity in mice was determined by administering 12, 6, 3, or 0 mg/kg during days 7 to 16 of gestation. Oral administration of decamethrin to pregnant mice resulted in a dose-related ($p < 0.001$) reduction in maternal weight gain. No effects on the number of implants, fetal mortality, fetal weights, or congenital bone malformations were noted. Decamethrin was not mutagenic in assays with *Salmonella typhimurium* strains TA 1535, TA 1537, TA 98, or TA 100, or in *E. coli* WP2, either with or without metabolic activation.

**79-1422.** Koschier, F. J.; Conway, W. D.; Rennick, B. R. (Dep. Physiol., SUNY Buffalo, Buffalo, NY) **Renal Transport and renal metabolism of 2,4,5-trichlorophenoxyacetate by the chicken.** *J. Environ. Pathol. Toxicol.* 2(3): 927-940; 1979. (25 references)

For the renal slice technique of studying transport of compounds by avian species, 2-3 kg hens were sacrificed and their kidneys removed. The cranial, middle, and caudal kidney lobes were sliced into thin (0.3-0.5 mm) sections and incubated with KPR buffer medium containing designated amounts of $^{14}$C- 2,4,5-T. The *in vitro* study demonstrated a slice-to-medium ratio of the $^{14}$C label of 26 after a 2 hr incubation period. Competitive inhibitors (probenecid and phenol red) and metabolic inhibitors (dinitrophenol and iodoacetamide) significantly reduced ($p < 0.05$) the accumulation of $^{14}$C. *In vitro* metabolism of 2,4,5-T was apparent in the renal slice studies and this metabolism was much greater (86.1%) than metabolism by rat (trace) or rabbit (trace) kidneys. The *in vivo* renal proximal tubular transport of the pesticide was studied by infusing the herbicide into the saphenous vein of chickens at the rate of 0.29 n*M*/min. The $^{14}$C-label originally associated with 2,4,5-T was shown to be secreted by the renal tubule. Probenecid inhibited the transport of the labeled herbicide without affecting the transport of TEA (tetraethylammonium), an organic cation transported by the renal proximal tubule.

**79-1423.** Akhtar, M. H. (Anim. Res. Inst., Res. Branch., Agr. Canada, Ottawa, Ont., Canada) **Sequential participation of glutathione and sulph-hydryl(s) in reductive dechlorination of 2,4-di- and 2,4,5-trichloro phenacyl chlorides by soluble fraction (105,000 x g) of chicken liver homogenate.** *J. Environ. Sci. Health B* 14(1): 53-71; 1979. (13 references)

The mode of reductive dechlorination of 2,4-di- and 2,4,5-trichloro phenacyl chlorides (tetrachlorvinphos metabolites) into the respective acetophenone was studied. The procedure involved the incubation of the soluble fraction from chicken liver homogenate with cofactor and substrate. Organo-extractable metabolites were analyzed using a gas chromatograph equipped with an electron capture detector. Melting points, NMR spectra and GC-MS analysis were also performed. The results indicated that the phenacyl chloride reacted first with glutathione to produce phenacyl glutathione. This was reduced enzymatically, in the presence of a sulph-hydryl group, to produce the Kepone.

**79-1424.** Richardson, R. J.; Davis, C. S.; Johnson, M. K. (Med. Res. Counc. Toxicol. Unit., Carshalton, Surrey, England) **Subcellular distribution of marker enzymes and of neurotoxic esterase in adult hen brain.** *J. Neurochem.* 32(2): 607-615; 1979. (41 references)

Neurotoxic esterase (NTE) had been established as the target of primary biochemical lesion in delayed neuronal degeneration caused by certain organophosphorus esters. The subcellular distribution of NTE and marker enzymes was studied in adult hen brain incubated with paraoxon or paraoxon plus mipafox. NTE was recovered from microsomal $P_3$ fractions enriched in the plasma membrane marker 5'-nuceleotidase (5'-ribonucleotide phosphohydrolase). The $P_3$ protein content is double that of equivalent mammalian brain fractions and contains many small synaptosomes. Unsuccessful attempts were made to separate the NTE 5'-nucleotidase and glucose-6-phosphatase from each other by rate

and equilibrium centrifugation on sucrose density gradients. Localization of NTE and AChE was also found in subfraction $P_2$ of neonatal chick brain from nonmyelinated axons. Mitochondrial and nuclear fractions were not very high in NTE. The partitioning of microsomes into biphasic aqueous polymer systems did little to increase the level of NTE. The synaptosomal membrane localization of NTE suggests that early events in organophosphorus neuropathy may take place at the axonal (synaptic) surface.

**79-1425.** Salpeter, M. M.; Kasprzak, H.; Feng, H.; Fertuck, H. (Sect. Neurobiol. & Behav., Dep. Appl. Phys., Cornell Univ., Ithaca, NY 14853) **Endplates after esterase inactivation *in vivo*: correlation between esterase concentration, functional response and fine structure.** *J. Neurocytol.* 8(1): 95-115; 1979. (49 references)

The recovery time course of mouse sternomastoid muscles incubated with DFP *in vivo* was studied histochemically, physiologically, and autoradiographically. When the esterases at the neuromuscular junctions were saturated with DFP, the ability of the muscle to sustain tetanus during nerve stimulation was eliminated. When 10% of the DFP-binding sites were recovered, the tetanus-sustaining ability was recovered to some extent. A correlation was noted between the frequency of stimulation at which the tetanic response was maintained and the amount of AChE recovery. The tetanic responses at 100 Hz (fusion frequency) were indistinguishable from that of controls with approximately 25% normal AChE activity. Butyrylcholinesterase recovered more rapidly than AChE. Within hours after esterase inactivation, Z band dissolution and breakdown of sarcoplasmic reticulum were noted. Peak disturbance of the nerve ultrastructure occurred by the third day after esterase inactivation but returned to normal two weeks later. The myopathy could be eliminated completely if, at the time of DFP administration, the nerve was severed or the AChE receptors at the endplate were inactivated by $\alpha$-bungarotoxin. It is suggested that the observed ultrastructural changes which occur after DFP administration are mediated by $Ca^{2+}$ fluxes due to prolonged action of acetylcholine in the absence of esterases.

**79-1426.** Anaizi, N. H.; Cohen, J. J. (Dep. Physiol., Univ. Rochester, Sch. Med. & Dent., Rochester, NY) **The effect of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on the renal tubular secretion of phenolsulfonphthalein.** *J. Pharmacol. Exp. Ther.* 207(3): 748-755; 1978. (20 references)

Male Long-Evans hooded rats were given a single ip injection of TCDD at 10 $\mu$g/kg. Five to 7 days following treatment there was no difference in the mean arterial pressure between control and treated rats. However, a significant decrease was noted in the glomerular filtration rate per gram wet kidney weight in the treated animals compared to controls. There was also a notable decrease in body weight. An increase was noted in the apparent affinity of the secretory system for phenolsulfonphthalein (PSP) since a significant increase in the tubular secretion rate of PSP occurred at low plasma levels of PSP. No increase was noted in the maximum secretory capacity for PSP. A significant decrease was noted in the glomerular filtration rate. This occurred without a change in the mean arterial pressure, suggesting that the glomerular structure may have a high sensitivity to TCDD.

**79-1427.** Nazarova, T. A.; Pavlova, N. N.; Makeev, A. M.; Chkanikov, D. I. (Author address not given) **Transport i metabolizm 2,4-D v rasteniyakh iachmenia raznogo vozracta. [Transport and metabolism of 2,4-D in barley plants of various levels of maturity].** *Khim. Sel'sk. Khoz.* 16(11): 34-36; 1978. (10 references) (Russian)

An attempt was made to test the hypothesis that various sensitivities of barley plants to herbicide 2,4-D are associated with different rates of metabolism of the herbicide at different stages of maturity. The apical part of the barley leaf at the 2-, 3- and 4-leaf stage was treated with $^{14}$C-2,4,D (2 $\mu$g; 229 mCi/g). Three days after the treatment, the content of nonchanged, conjugated and hydroxylated fractions of 2,4-D were assessed by thin layer chromatography. It was found that the total amount of 2,4-D that underwent metabolic transformation increased from 70.3% in plants at the 1-leaf stage to 79.2% in plants at the beginning of the tillering (4-leaf stage). The increase in the rate of metabolism was primarily due to intensified hydroxylation (at the 1-leaf stage there were 31.6% hydroxylated metabolites, compared with 57.4% at the 4-leaf stage) and, correspondingly, to the decrease in the conjugation of 2,4-D with amino acids and carbohydrates (38.7% vs 21.8%). Since hydroxylated metabolites of 2,4-D lack phytotoxicity and mobility (translocation from the site of application), these findings might explain the greater resistance of the barley at the tillering stage.

**79-1428.** Brestkin, A. P.; Zhukovskii, Iu. G.; Roslavtseva, S. A.; Spirina, T. A. (I. M. Sechenov Inst. Evol. Physiol. & Biochem., Moscow, USSR) **Fermentativnyi gidroliz akreksa. [Enzymatic hydrolysis of Acrex.]** *Khim. Sel'sk. Khoz.* 16(11): 74-77; 1978. (10 references) (Russian)

To evaluate the mechanism of the selective effect of dialkylcarbonate insectoacaricides, the enzymatic hydrolysis of *O*-isopropyl- *O*-(2,4-dinitro- 6-isobutylphenyl) carbonate (Acrex, dinobuton) was studied. Incubation of Acrex with a lyophilized preparation of cholinesterase (derived from horse serum) resulted in 93.8% hydrlysis of the insecticide. After the addition of the specific inhibitor of cholinesterase, tetra-*o*- cresyl phosphate, the enzyme almost completely lost its ability to hydrolyze Acrex. Incubation of Acrex with tissue homogenate of *Tetranychus urticae Koch* tick (10 mg/ml) caused significant hydrolysis of the insecticide; the rate of hydrolysis was significantly greater than that observed after the incubation of Acrex with homogenates of bovine brain tissue at 30 mg/ml. These findings indicate that the high toxicity of Acrex for ticks is associated with the high rate of hydrolysis of this compound in tick organisms.

**79-1429.** Ferguson, P. W.; Anderson, J. H.; Krieger, R. I. (Dep. Environ. Toxicol., Univ. California, Davis, CA) Se-

**condary thrombocytopenia following phenobarbital treatments in a rhesus monkey (*Macaca mulatta*).** *Lab. Animal Sci.* 29(1): 94-96; 1979. (14 references)

A case study of an 8-yr-old rhesus monkey developing thrombocytopenia (subnormal levels of blood platelets) following an 11 day exposure to 30 mg/kg/day Na phenobarbital is described. Prior to the phenobarbital treatment the animal underwent a chronic DDT feeding study (diet levels up to 100 ppm DDT) for 10 mo. On the 11th day of phenobarbital injection ecchymotic hemorrhage appeared in the inguinal and axillary areas, face, chest, hands, and mucous membranes of the mouth. Routine blood sampling showed greater time required for control of bleeding. Recovery was gradual and complete by day 22. During the episode, blood DDT levels remained stable while blood phenobarbital concentrations paralleled the course of the illness. These observations, together with the lack of adverse signs from previous DDT blood concentrations 100 x higher indicated that there was no direct relationship between DDT and thrombocytopenia. A subsequent phenobarbital challenge produced identical reactions in the animal.

**79-1430.** Hoover, K. L.; Stinson, S. F.; Ward, J. M. (Pathol. Branch, Natl. Cancer Inst., Bethesda, MD 20014) **Histopathologic differences between nitrofen-induced and naturally occurring hepatocellular carcinomas in the B6C3F1 mouse.** *Lab. Invest.* 40(2): 261; 1979.

Male and female mice of the B6C3F1 strain were fed low or high doses of nitrofen and their hepatic tumors were compared histologically with naturally occuring tumors in control mice. The hepatocellular carcinomas of the herbicide-treated mice were consistantly different from those of the controls, with enlarged eosinophilic hepatocytes usually arranged in a solid pattern. The tumors in nitrofen-fed mice also showed some metastases in the lungs. a phenomenon not seen with tumors in the control mice. These results suggest that the liver tumors induced in mice by nitrofen are morphologically unique, and that nitrofen acts as an actual hepatic tumor inducer rather than as a promoter of natural tumors.

**79-1431.** Kar, S.; Singh, P. K. (Lab. Blue-green Algae, Cent. Rice Res. Inst., Cuttack 753006, Orissa, India) **Effect of pH, light intensity and population on the toxicity of the pesticide carbofuran to the blue-green alge *Nostoc muscorum*.** *Microbios* 21(85-86): 177-184; 1979. (22 references)

The toxicity of furadan (containing 3% carbofuran) to the blue-green algae *Nostoc muscorum* as affected by light intensity, pH, and population was studied in laboratory cultures of the algae. Results showed that the alga grew better in a pH range of 7.5-10. Growth was retarded by acidic pH levels of 5-6. Toxicity was increased in the acidic pH medium, but decreased when the medium was at pH 7.5-10. Growth of the alga was retarded under a light intensity of 1,500 lux, and no growth occurred in the dark. A decrease in toxicity of furadan was noted with an increase in light intensity. When the initial population level of the algal culture was low, the toxicity of the pesticide was increased. An increase in initial population decreased the toxicity of furadan. These findings suggest that the environmental and physiological conditions of the application site should be taken into consideration before determining the concentration of pesticide necessary for effective use.

**79-1432.** Murthy, M. S. S. (Div. Radiol. Prot., Bhabha At. Res. Cent., Trombay, Bombay 4000085, India) **Induction of gene conversion in diploid yeast by chemicals: correlation with mutagenic action and its relevance in genotoxicity screening.** *Mutat. Res.* 64(1): 1-17; 1979. (57 references)

More than 200 chemicals, comprising drugs, pesticides, herbicides, industrial chemicals, food additives, etc. tested by various workers for their ability to induce gene conversion in diploid yeast, have been reviewed. This review shows that strong correlation exists between the convertogenic and mutagenic abilities of these chemicals. This conclusion confirms the earlier one by Zimmermann which was based on fewer mutagenic chemicals. Published data have further been analyzed to confirm quantitatively Zimmermann's other important conclusion that gene conversion is not mutagen-specific. This is a positive advantage in using gene conversion in preliminary screening of chemicals because it reduces the chances of false negatives. (Author abstract by permission)

**79-1433.** Matsuoka, A.; Hayashi, M.; Ishidate, M., Jr. (Div. Mutagenesis, Biol. Safety Res. Cent., Natl. Inst. Hyg. Sci., Tokyo 158, Japan) **Chromosomal aberration tests on 29 chemicals combined with S9 mix *in vitro*.** *Mutat. Res.* 66(3): 277-290; 1979. (25 references)

A metabolic activation system with rat-liver microsome fraction plus cofactors (S9 mix) was applied to chromosomal aberration tests *in vitro* for the screening of chemical mutagens or carcinogens in the environment. Dialkyl nitrosamines only induced chromosomal aberrations in Chinese hamster cells (CHL) when treated with S9 mix. The incidence of chromosomal aberrations in CHL varied with experimental conditions, e.g. incubation time, recovery time, components of S9 mix and inducers used for preparation of S9. For dimethyl nitrosamine (DMN), the maximal incidence was obtained when the cells were incubated with S9 mix for 3 hr and harvested 24 hr after treatment. Therefore, this system (3 hr incubation and 24 hr recovery) was routinely applied to further screening of other chemicals with S9 prepared from PCB-pretreated rats. Ten carcinogens (e.g. 7,12- dimethyl benz [a] anthracene, benzo [a]pyrene, quinoline, etc.) out of 16 induced aberrations when they were treated with S9 mix, whereas the remaining 6 carcinogens (e.g., 3-methyl cholanthrene, 4-*o*- tolylazo-*o*- toluidine, etc.) induced few or no aberrations even after activation. Two insecticides, allethrin and diazinon, were strongly positive at relatively low doses only when they were activated with the S9 mix. Medical drugs, such as ethenzamide, methyl *p*-hydroxybenzoate and nitrofurazone, and a food additive, sodium hypochlorite, were positive on activation. Chemicals used for industry, such as styrene monomer and tris-dichloro propylphosphate,

were also positive in our activation system. (Author abstract by permission)

**79-1434.** Lloyd, C. (Author address not given) **Poles apart?** *Nature (London)* 277(5697): 1979. (5 references)

Microtubule-organizing centers (MTOCs) are believed to exist at each spindle pole of each algae or fungi cell to aid in constructing spindle fibers to guide sister chromatids during cell division. In cells of higher plants, however, definite pole bodies seem to be lacking, and it was suggested that endoplasmic reticulum may function as MTOCs in such systems. During the study of presumptive spindle organizers, it was discovered that the herbicide CIPC (chlorpropham) caused the formation of multinucleate cells presumably by the induction of multipolar mitotic spindles. Unlike colchicine, CIPC did not inhibit the assembly of tubulin, and it was concluded that this herbicide does not affect microtubules but acts on spindle MTOCs. Similar effects were observed with *in vitro* studies using IPC (propham). So far ultrastructural investigations, have failed to uncover whether these herbicides are affecting some endoplasmic reticulum MTOC or another amorphous nucleation site.

**79-1435.** Nishimura, M.; Ishizu, S.; Hyakutani, H.; Sato, M. (Sch. Public Health, Tokyo Woman's Med. Coll., Tokyo, Japan) **[Effects of methyl bromide in cultured cells of mammals.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 34(1): 182; 1979. (Japanese)

The effects of methyl bromide on HeLa cells and cultured rat cells (1st generation, kept in a $CO_2$ atmosphere at 37°C) from the brain, kidney, and muscles were investigaed. Cells were observed microscopically three days after treatment with an ethanolic solution of methyl bromide. The LD100 concentrations of methyl bromide, methanol, and sodium bromide to HeLa cells were found to be 0.1 m*M*, 2.5 *M*, and 0.1 *M*, respectively, suggesting that methyl bromide caused the most injury to the HeLa cells. Methyl bromide toxicity increased with increasing length of exposure up until 24 hr. HeLa cells were denatured and distintegrated, however, the size and number of cells were not affected. The LD100 concentration of methyl bromide was 10 μg/ml in cells of the brain, kidney and muscles. However, some differences in toxic action of methyl bromide to these three types of 1st generation cells were observed upon microscopic examination. [At the 49th annual meeting of the Jpn. Assoc. of Hyg.]

**79-1436.** Ando, M.; Wakisaka, I. (Dep. Environ. Health, Natl. Inst. Environ. Pollut., Tsubuka, Ibaragi, Japan) **[Effects of protein in diet on the metabolism of DDT.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 34(1): 185; 1979. (1 reference) (Japanese)

Male Wistar rats were fed for 2 wk on diets containing five different levels of both protein and fat. At the end of the 2 wk, DDT was injected ip, and residues of *p,p'*-DDT were determined after 22 days of DDT administration. The concentration of *p,p'*-DDT in the liver decreased with the increase of protein in feed. The concentrations of DDD (TDE) and DDE in the liver peaked at the feed protein content of 20-30%. The value of DDD plus DDE divided by total DDT and multiplied by 100, which is considered to show the rate of metabolism of DDT, increased with greater amounts of protein in feed. It was concluded that increased dietary protein accelerates the metabolism and the excretion of DDT. [At the 49th annual meeting of the Jpn. Assoc. Hyg.]

**79-1437.** Nishimura, H.; Nishimura, N.; Ooshima, H. (Sch. Hyg., Aichi Med. Coll., Nagoya, Aichi, Japan) **[Experimental studies of paraquat dichloride intoxication.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 34(1): 186; 1979. (Japanese)

The subacute toxicity of paraquat dichloride was studied in male Wistar rats. Paraquat dichloride was orally administered to rats 2 times per wk for 3 mo at doses of 5, 10, or 20 mg/kg. After 3 mo, the rats were sacrificed and autopsied. In all groups, paraquat had no effect on body weight gain. Except for a change in the hematocrit value in the 10 mg dose group, no abnormal changes were observed in the urine proteins, total urinary amino acids, or hematological data. A significant reduction in the weights of the liver, spleen and the right kidney was observed in the paraquat-treated groups. A significant increase in testicular weight was also noted in the paraquat-treated groups. The lungs of paraquat-dosed rats were white in color with scattered black spots. Microscopically, hypertrophy of the alveolar septa was found with accompanying fibroblasts, macrophages, and monocytes. An increase in cell division in the liver was also observed in the paraquat-treated rats. [At the 49th annual meeting of the Jpn. Assoc. Hyg.]

**79-1438.** Yamanaka, S.; Nishimura, M. (Sch. Hyg. Tokyo Dent. Coll., Tokyo, Japan) **[Effects of cholinesterase inhibitors on isozyme.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 34(1): 187; 1979. (1 reference) (Japanese)

Doses of 50% of the oral LD50 values of parathion, dichlorvos, fenitrothion or prothiophos (*O*- 2,4- dichlorophenyl *O*-ethyl- *S*-propyl phosphorothioate) were administered to male Wistar rats. To some of the rats, PAM was administered ip at 100 mg/kg, simultaneously. Blood specimens were collected after 1, 3, 6, and 24 hr post-administration, and the serum was added to polyacrylamide-gradient gel for electrophoresis. The separated gel was incubated in a phosphate buffer solution containing 1% α-naphthyl acetate acetone and Fast Violet B salt for staining of the cholinesterase. The zymogram obtained was investigated by photospectroscopy at 520 nm. The serum cholinesterase of non-treated rats was separated into 20 izozymes. Cholinesterase activity was markedly inhibited by prothiophos, however, its isozymes No. 7, 17, and 18 were scarcely inhibited, resembling the inhibition *in vitro* by prothiophos-oxon. Izozymes No. 12 and 16 were mainly inhibited by dichlorvos. Isozymes No. 7 and 12 were mainly inhibited by parathion. In rats given PAM, the recovery of cholinesterase, (especially isozyme No. 7) was noted. These findings suggest that the pattern of cholineste-

rase inhibition differs among the organophosphorus pesticides, and the PAM exerts an antagonistic effect on parathion which is specific for the inhibition of isozyme No. 7. [At the 49th annual meeting of the Jpn. Assoc. Hyg.]

**79-1439.** Nishizumi, M. (Sch. Public Health, Fac. Med., Kyushu Univ., Fukuoka, Japan) **[Effect of DDT and phenobarbital on the accelerating action of PCBs in liver cancer generation due to diethylnitrosamine.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 34(1): 197; 1979. (1 reference) (Japanese)

Two hundred male Wistar rats were divided into ten groups. Groups one through eight were dosed orally with an aqueous solution of 50 ppm diethylnitrosamine (DEN) for 2 wk, and were then given PCB (10% in olive oil, 0.1 ml x 2/wk), DDT (1.25% in olive oil, 0.1 ml x 2/wk) and phenobarbital (500 ppm in water, ad libitum), singly, or in combinations using two or all three of these compounds. The percentage of liver weight to body weight at 40 and 52 wk from the beginning of the experiment, and the weight of liver tumors larger than 5 mm in diameter were determined. In rats given DEN alone, no liver tumors larger than 5 mm in diameter were found. In rats given PCB along with DEN the number of liver tumors was significantly increased. In rats given phenobarbital along with DEN, the number of liver tumors showed an increase over that of controls, however, it was not greater than the number of tumors observed in rats given DEN and PCB alone. In rats given PCB and DDT along with DEN, the number of liver tumors was significantly less at 40 wk than the number found in rats given PCB and DEN. In rats given PCB, DDT and phenobarbital along with DEN, the number of liver tumors was less than that in rats given PCB and DEN. The type of tumor commonly found was a hepatic cytoma with no metastases to other organs. It is suggested that DDT acts to inhibit the acceleration of tumor generation by PCB during the early stages of tumor development. [At the 49th annual meeting of the Jpn. Assoc. Hyg.]

**79-1440.** Shishido, T. (Natl. Inst. Agric. Sci., Tokyo, Japan) **[The role of glutathion *S*-transferases in pesticide metabolism. A review.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 3(Suppl.): 465-473; 1978. (50 references) (Japanese)

A review summerizing recent research on the metabolism of pesticides by glutathion *S*-transferase conjugation, the role of this reaction in pesticide selectivity by mammals and plants, and the characteristics of the transferase is given. This conjugation is known to occur with organophosphorus, organocyanate and γ-BHC (lindane) insecticides, *S*-triazine, fluorodifen and thiocarbamate herbicides, EDB (ethylene dibromide), and monofluoro acetic acid. The enzymes are widely distributed in mammals, birds, fish, insects, plants and microorganisms. The function of glutathion *S*-transferases is believed to be the biological protection against electrophilic foreign compounds which have the capability to bind to biological molecules with nucleophilic centers. The qualitative and quantitative differences in the enzymes are closely associated with insecticide or herbicide selectivity, and insecticide resistance.

**79-1441.** Patil, T. N.; Radhakrishnamurty, R. (Discip. Biochem. & Appl. Nutr., Cent. Food Technol. Res. Inst., Mysore 570013, India) **Biochemical changes induced by α -naphthylthiourea in albino rats.** *Pestic. Biochem. Physiol.* 8(3): 217-224; 1978. (40 references)

Albino Wistar rats were kept in metabolism cages and fed 10 mg/kg of the rodenticide α-naphthylthiourea (ANTU). Urine was collected over 22 hr, and blood samples were collected at specific times. At the end of the experiment, animals were sacrificed for tissue studies. Results showed that the feeding of α-naphthylthiourea to rats caused excessive urinary excretion of inorganic phosphorus, urea, and albumin over a period of 22 hr. Blood inorganic phosphorus, creatinine, and glucose were increased. Pleural effusion studies also resulted in elevated glucose, creatinine, and inorganic phosphorus. The urea level in pleural effusion and blood also increased during the experiment with an accompanying rise in arginase activity. Blood levels of phospholipids, triglycerides, and cholesterol were also significantly increased. There were no changes observed in hepatic fat content or cholesterol level. Tissue studies showed lesions in the glomerular region of the kidney after 8 hr. Later in the experiment the damage to the kidney was similar to acute glomerular nephritis of the lipoidal type. From these results it is not certain what role nephrotoxicity plays in the cause of death to rats by α-naphthylthiourea.

**79-1442.** Fukuto, T. R. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Insecticide metabolism and mode of action.** *Pure Appl. Chem.* 50(9-10): 1015-1032; 1978. (20 references)

The *in vitro* and *in vivo* metabolism processes of the chiral isomers of fonofos were examined. X-ray diffraction analysis and chemical correlation were used to determine the absolute configurations of the fonofos isomers and their relevant oxidation products. When fonofos was ozidized to its corresponding oxon in the presence of mouse liver mixed-function oxidase, the configuration of the compounds was, for the most part, maintained. The stereoselectivity of the oxon in target site inhibition is used to expalin the difference in toxicities of the fonofos enantiomers to insects and mammals. The stereoselectivity in the conversion of fonofos to fonofos oxon and its detoxication by other enzymes may also help to explain the difference in the observed toxicities of the isomers of fonofos.

**79-1443.** Ludwicki, J. (Natl. Inst. Hyg., PL-00791 Warsaw, Poland) **Wplyw pestcydow rtecioorganicznych na aktywnosc kwasnej fosfatazy arylosulfatazy a i beta-glukuronidazy w watrobie oraz katalazy we krwi szczura. [The effect of organomercury pesticides on the activity of acid phosphatase, arylsulphatase A and β-glucuronidase in the liver and catalase in blood of rats.]** *Rocz. Panstw. Zakl. Hig.* 29(6): 641-647; 1978. (8 references) (Polish)

Phenylmercury acetate (PMA) may exist as a contaminant in food. The influence of PMA on lysosomal enzyme fractions of rat liver and the activity of catalase in rat

blood were studied. PMA was given orally to male and female Wistar rats in doses of 0, 2, 20, and 50 mg Hg/l of drinking water, and the activity of acid phosphatase, β-glucuronidase, arylsulphatase A, and blood catalase were determined after 2, 4, and 16 wk. A statistically significant, dose dependent decrease in activity was found for arylsulphatase A. In the case of β-glucuronidase and acid phosphatase, the decrease of total activity was found only after 2 wk. At 4 and 16 wk, the changes in this enzyme were statistically insignificant. No differences in enzyme activity between male and female rats were observed. A significant, dose dependent decrease in activity of blood catalase was also noted. In wk 16 of the experiment, a 43% decrease in the level of catalase activity in male rats and a 53% decrease in female rats was found.

**79-1444.** Kolodziejczyk, A.; Kolodziejczyk, E.; Kolodziejczyk, L. (Inst. Ind. Org., PL-43200 Pszczyna, Poland) **Badania toksycznosci kumulacyjnej bromfenwinfosu (IPO-62). [Studies of cumulative toxicity of bromfenvinfos (IPO-62).]** *Rocz. Panstw. Zakl. Hig.* 29(6): 649-653; 1978. (6 references) (Polish)

The toxicity of the Polish pesticide, bromfenvinfos, was studied in acute and subacute tests in male and female Wistar rats. The active ingredient (*O,O*- diethyl- *O*- 1-(2,4-dichlorophenyl)- 2-bromovinyl phosphate) was administered in an aqueous emulsion with Tween, and the acute LD50 was calculated by Weil's method. The LD50 was 21.4 mg/kg of body weight for males and 27 mg/kg for females. In subacute oral toxicity the emulsion was given in doses of 10.9% of LD50 to male rats, and 14.0% of LD50 to female rats for the first 4 days. After the 4-day period, the dose was increased by a factor of 1.5. The chronic LD50 dose (calculated by Lima's method) was 99.5 mg/kg/day for males and 43.0 mg/kg/day for females. The cumulation indices were calculated to be 4.65 and 1.56 for males and females, respectively. It was concluded from these results that bromfenvinfos has no cumulative effect in rats.

**79-1445.** Tyrkiel, E. (Natl. Inst. Hyg., PL-00791 Warsaw, Poland) **Wplyw *O*-izopropoksyfenylo- *N*- metylokarbaminianu (propoksuru) na rozwoj embrionalny myszy. [Effect of *O*-isopropoxyphenyl- *N*- methylcarbamate (propoxur) on the embryonal development of mice.]** *Rocz. Panstw. Zakl. Hig.* 29(6): 655-664; 1978. (16 references) (Polish)

Propoxur was administered to Balb/c and CF/W mice either through gastric tube or ip in doses of 31 mg/kg, 10.5 mg/kg, or 3.5 mg/kg between days 4 and 13 of pregnancy. No teratogenic changes were found in either strain due to the pesticide, however, some embryotoxic properties of propoxur were noted. A two-fold increase in blastocyst mortality was found in the Balb/c mice treated with the highest dose of propoxur in the early stages of pregnancy. No such effect was observed from lower doses of the compound. A statistically significant increase in the number of resorptions was also observed in mice treated with propoxur.

**79-1446.** Szulinski, S. (Natl. Inst. Hyg., PL-00791 Warsaw, Poland) **Zastosowanie szybkiej metody oceny sprawnosci osrodkowego ukladu nerwowego malych zwierzat laboratoryjnch w badaniach sanitarno-toksykologicznych. [A rapid method of estimating the efficiency of the central nervous system of small laboratory animals in sanitary-toxicological investigations.]** *Rocz. Panstw. Zakl. Hig.* 29(6): 677-681; 1978. (7 references) (Polish)

A modification of the conditioned reflex method was used to estimate the influence of small doses of environmental contaminants on the central nervous system of homiothermic animals. The method was based on continuous differentiation and conditioned reflexes. A group of rats were kept in a cage equipped with an electronic device, designed to record the results automatically. A total of 108 rats were given trichlorfon at doses of 5 mg/l for a period of 2 mo. There was a 4.2% decrease in differentiation and conditioned reflex efficiency compared to controls. Effects of other pesticides and detergents on the central nervous system of 240 rats, (second, third and fourth generations of the original test group) were observed. Trichlorfon (5 mg/l), lindane (50 mg/l), and Kosulfonate-40 (10 mg/l), as well as trichlorfon and lindane, trichlorfon, lindane, and Kosulfonate-40, and vinyl chloride (1, 3, 10 and 30 mg/m$^3$) were given to the parent generation. Statistically significant effects of the chemicals on the central nervous systems of the off-spring of the treated rats were noted. Kosulfonat-40 had the longest delayed effect, with damage appearing in the fourth generation. The harmful effects of lindane and trichlorfon were increased in the third and fourth generations, when administered singly and in combination.

**79-1447.** Lyr, H.; Seyd, W. (Inst. Pflanzenschutzforsch. Kleinmachnow, Akad. Landwirtschaftswiss., DDR-1532 Kleinmachnow, DDR) **Hemmung der Chitin-Synthetase von *Mucor rouxii in vitro* durch Fungicide und andere Wirkstoffe. [Inhibition of chitin synthetase in *Mucor rouxii in vitro* with fungicides and other materials.]** *Z. Allg. Mikrobiol.* 18(10): 721-729; 1978. (23 references) (German)

The inhibiting effects of 23 fungicides and other substances on chitin synthetase of *Mucor rouxii in vitro* were examined. The reaction time was 1 hr at 22°C. Most of the *in vivo* effective fungicides proved to be ineffective when tested *in vitro*. PH 60-40 (diflubenzuron) was the most effective inhibitor (99.8%) at levels of 0.1 m*M*. The inhibition rates for Polyoxin D, Terrazol, tridenmorph, and PH 60-40 at 0.1 m*M* were 52%, 30%, 44%, and +6%, respectively. For Hinosan (edifenphos), the inhibition rate was 61% at 1m*M* . The ED50 values were 1.8 m*M* for Terrazol, 0.08 m*M* for Polyoxin D, 0.5 m*M* for tridemorph, 0.3 m*M* for Hinosan, and 3 μ*M* for PH 60-40. Inhibition of phospholipase C, unsaturated fatty acids, and the reversibility of the inhibition by Terrazol, after the addition of procaine hydrochloride, demonstrated that phospholipids are essential for the chitin synthetase activity, whereas sterols seem to be ineffective. Trypsin, PCNB (quintozene), pentachlorophenol (PCP) and some similar compounds caused a significant increase in the enzyme activity. Hinosan was found to inhibit the enzyme in an unknown manner.

*See also* 79-1254, 79-1277, 79-1326, 79-1479, 79-1484 *and* 79-1498.

**79-1448.** Caverly, D. J.; Denney, R. C. (Agric. Dev. & Advis. Serv., Min. Agric. Fish. & Food, Ashford, Kent TN25 5EL, England) **Determination of substituted ureas and some related herbicide residue in soils by gas chromatography.** *Analyst (London)* 103(1225): 368-374; 1978. (22 references)

A method for the determination of 11 substituted ureas and related herbicides in soils is described. Acetone extraction is followed by alkaline hydrolysis, steam distillation and concentration of anilines in toluene, the last three steps being carried out in a single operation using a liquid-liquid extractor. The anilines, after partition into hydrobromic acid, are brominated and determined by gas chromatography with an electron-capture detector. The procedure is sufficiently sensitive for investigations into problems of crop damage and can be applied to a wide variety of soil types. An additional step to remove interference due to the presence of aniline metabolites is also described. The limit of detection is 0.01 mg/kg and recoveries at residual levels are generally better than 80%. (Author abstract by permission)

**79-1449.** Wade, A. L.; Hawkridge, F. M.; Williams, H. P. (Dep. Chem., Univ. Southern Mississippi, Hattiesburg, MS 39401) **Direct determination of pentachlorophenol by differential pulse polarography.** *Anal. Chim. Acta* 105(1): 91-97; 1979. (31 references)

Differential pulse polarography at the dropping mercury electrode and differential pulse voltammetry at the carbon paste electrode are used for direct determinations of pentachlorophenol (PCP) at concentrations down to 0.27 ppm. PCP is electrochemically reduced in phosphate buffers at pH 8 to produce a concentration-dependent current peak at -0.8 V vs. Ag/AgCl. The procedure requires only 15 min. Cyclic voltammetry at the hanging mercury drop electrode is used to evaluate the electrochemical reaction and to establish the reversibility of the PCP electrode reaction. (Author abstract by permission)

**79-1450.** Soderquist, C. J.; Crosby, D. G. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Determination of triphenyltin hydroxide and its degradation products in water.** *Anal. Chem.* 50(11): 1435-1439; 1978. (20 references)

An analytical method has been developed for the simultaneous determination of triphenyltin hydroxide and its possible degradiation products tetraphenyltin, diphenyltin oxide, benzenestannoic acid, and inorganic tin in water. The method is rapid (one sample set per hr), sensitive to less than 0.01 μg/ml for most of the tin species, exhibits no cross-interferences between the phenyltins, and requires no elaborate equipment. The phenyltins are detected by electron-capture gas-liquid chromatography after conversion to their hydride derivatives, while inorganic tin is determined by a procedure which responds to tin(IV) oxide as well as aqueous tin(IV) cation, a procedure not previously described in the literature (Author abstract reprinted by permission of the American Chemical Society.)

**79-1451.** Roder, C. H.; Jenny, N. A.; Ottnad, M. (Schering AG, Berlin, Germany) **Desmedipham.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 27): 293-303; 1978. (4 references)

Desmedipham is used as a postemergence herbicide. It is particularly useful for control of weeds in beet crops, acting only through the leaves. The chemical is sold under the trade names of Betanal AM and Betanex, and is an emulsifiable concentrate containing 15.9% w/w active ingredient. Bromination of aniline, which results from alkaline hydrolysis of desmedipham, is the basis of the formulation analysis for the content of active ingredient in the preparation. This procedure, however, cannot be used for emulsifiable concentrate formulations. Total nitrogen is determined by a modified Kjeldahl procedure. High-pressure liquid chromatography can be used to obtain a more specific determination of desmedipham. The recommended method for residue analysis consists of alkaline hydrolysis of crop samples yielding aniline. This is followed by bromination in aqueous acidic solution which forms 2,4,6-tribromoaniline, which is in turn measured by gas chromatographic equipment using an electron capture detector.

**79-1452.** Suzuki, H. K.; Whitacre, D. M.; Atallah, Y. H. (Velsicol Chem. Corp., Chicago, IL) **Dicamba.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 28): 305-310; 1978. (9 references)

Most of the recommended methods for analysis of dicamba residues involve an acidic extraction followed by partition and liquid solid chromatographic cleanup, methylation, and quantification using electron capture gas chromatography. Methods of analysis based on this procedure have been described for dicamba in water, soil, crop samples, and human blood and urine. A great improvement has been noted by using silica gel adsorption chromatography in place of the original buffered column purification step.

**79-1453.** Van Rossum, A.; De Wilde, P. C.; De Boer, F. G.; Korver, P. K. (Philips-Duphar Res. Lab., Weesp, The Netherlands) **Dichlobenil.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 29): 311-320; 1978. (8 references)

Dichlobenil is a nonselective soil herbicide, working primarily on growing points and root tips as it inhibits germination. The chemical can control both mono- and dicotylendons. Established non-target crops tolerate dichlobenil well. It is available as a wettable powder. The recommended method for formulation analysis calls for extraction with dichloroethane, which is followed by chromatography of dichlobenil on Chromosorb P coated with Carbowax 20 M. The internal standard for dichlobenil determination is methyl myristate. For residue analysis, 2,6-dichlorobenzamide is extracted with ethyl acetate. The extract is then cleaned up by column chromatography on alumina. 2,6-Dichlorobenza-

mide is detected by gas chromatography on XE-60 or a suitable alternative column using an electron capture detector. The recommended method for residue analysis of dichlobenil calls for extraction from crops with acetone, from wine or water with petroleum ether, and from soil or hydrosoil with a mixture of acetone and petroleum ether. Column chromatography on aluminum oxide is used to purify the extracts. Gas chromatography on SE 30μ or XE 60 is used for detection of dichlobenil.

**79-1454.** Leary, J. B. (Chevron Chem. Co., Richmond, CA) **Diquat and paraquat.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 30): 321-325; 1978. (8 references)

Residue analysis of diquat or paraquat calls for extraction of the sample by reflux with 18 *N* sulfuric acid, filtering, neutralizing, and cleaning up by means of an ion exchange column. Elution of the diquat or paraquat from the column is accomplished with saturated ammonium chloride. Spectrophotometric measurements are made after alkaline reduction with sodium dithionite to free radicals, which have strong absorption peaks at 380 nm, diquat or 394 nm, paraquat. This method has been tested using the following sample types: fresh crops, oily crops, dry crops, soil, animal tissues, blood plasma or serum, and urine. Whole blood may not be analyzed by this method. The limit of detectability is 0.01 ppm when a 50 g sample is used.

**79-1455.** Carlson, R.; Whitaker, R.; Landskov, A. (Agric. Chem. Div., PennWalt Corp., Tacoma, WA) **Endothall.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 31): 327-340; 1978. (4 references)

Endothall is a contact-active herbicide. The chemical does not translocate downward to a significant degree, nor does it translocate upward. The herbicide is active on plant membranes. Weeds in ponds and lakes, various weeds in turf, and chenopod crops can be controlled by application of the inorganic salts of endothall, either disodium or dipotassium. Amine salts are useful as defoliants, desiccants, or as aquatic herbicides and algicides. For formulation analysis the sample is treated with acidified acetone and a portion of the solution is injected into the gas-liquid chromatograph. For residue analysis the *N*-chloroethylamide derivative is formed and detected. Electrolytic conductivity or microcoulometric detectors in the nitrogen-specific modes are recommended, but the halogen specific modes may be used as well. Efficiencies in water at a 0.01 ppm level can be greater than 90%. Oily samples have an efficiency of only 70% at the 0.1 ppm level.

**79-1456.** Day, E. W. (Lilly Res. Lab., Greenfield Lab., Greenfield, IN) **Ethalfluralin.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 32): 341-352; 1978. (3 references)

Ethalfluralin controls a wide variety of grasses and broadleaf weeds with its preemergence herbicidal activity. It will not injure cotton, soybeans, dry beans, or some other broadleaf crops. Formulation analysis for ethalfluralin can be carried out by spectrophotometric methods in which technical material and liquid formulations are dissolved in hexane and chromatographed on Florisil columns to remove colored impurities. Solid formulations are extracted with chloroform, the solvent is removed, and the residue is dissolved in hexane for Florisil column chromatography. There is also a flame ionization gas chromatographic detection system which can be used. For residue analysis, the chemical is extracted from plant tissue and soil with methanol, purified by liquid-liquid extraction with methylene chloride, and separated by column chromatography over Florisil. Gas-liquid chromatography with electron capture detector is used for measurement and detection.

**79-1457.** Whiteoak, R. J.; Crofts, M.; Harris, R. J.; Overton, K. C. (Agrochem. Div., Fisons Ltd., Chesterford Park Res. Stn., Essex, England) **Ethofumesate.** In: *Analytical Methods for Pesticides and Plant Growth Regulators* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 33): 353-366; 1978. (1 reference)

Ethofumesate is applicable as either a pre- or postemergence selective herbicide for major use among beet and grass crops. In monocotyledons the major uptake of the chemical is into the seedling's emerging shoots. For dicotyledons the uptake occurs by root absorption. The recommended method for formulation analysis calls for dissolving the sample and separating it from impurities by gas chromatography. The internal standard used is trietazine. For analysis of residues in crops, the metabolites are examined, usually either the 2-hydroxy analog, or 2,3-dihydro- 3,3,dimethyl-2-oxo-5-benzofuranyl methanesulfonate. For analysis of soil residues, no extractable metabolites of ethofumesate have been found. The residues are extracted from soil with hot methanol. Minimal cleanup is needed by gas chromatographic procedures are used to determine the residue concentration.

**79-1458.** Whitacre, D. M.; Atallah, Y. H.; Forrette, J. E.; Suzuki, H. K. (Agric. Chem. Div., Pennwalt Corp., Tacoma, WA) **Methazole.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 34): 367-384; 1978. (9 references)

Weed control in cotton crops can be obtained through the use of the selective herbicide, methazole. There are possibilities of using this chemical in weed control on additional crops such as onions, sorghum, alfalfa, potatoes, citrus, and deciduous fruits and nuts. Infrared spectrophotometry is the best method for formulation analysis. Acetone is used as the measuring solvent. When using granular formulations preextraction with chloroform is needed to exclude moisture interference. For residue analysis liquid-liquid partitioning followed by liquid-solid adsorption chromatography provides adequate cleanup for direct analysis by HPLC or derivative formation.

**79-1459.** Dietz, E. A., Jr.; Moore, L. O. (Hooker Chem. & Plastics Corp. Res. Cent., Niagara Falls, NY) **Monomethylarsonic acid, cacodylic acid, and their sodium salts.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chater 35): 385-401; 1978. (43 references)

Postemergence control of various weeds and grasses can be achieved by using monomethane arsenate (MSMA) and cacodylate (DSMA). The only methods currently in general use for formulation analysis for methane arsonate and cacodylate involve the total-arsenic determination method or the acid-base titration technique. No accepted procedures exist for the specific determination of methane arsonate or cacodylate ions at trace levels in samples from the environment. Residue results are usually based on total arsenic analysis which involves oxidation of arsenic with nitric and sulfuric acids to the inorganic pentavalent form. Residual $HNO_3$ is destroyed by ammonium sulfate, and potassium iodide is used to reduce the arsenic ion to the trivalent species. After the liberated iodine is distilled and the pH adjusted, the arsenic is titrated with iodine using a starch indicator. In the potentiometric titration of the acid-base method, methane arsenate and cacodylate formulations can be titrated with HCl in the absence of interferences from surfactants or inert ingredients.

**79-1460.** Adler, I. L.; Jones, B. M. (Rohm & Haas Co., Spring House, PA) **Nitrofen.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 36): 403-414; 1978. (3 references)

Nitrofen is used to control various grasses and broadleaf weeds. It can be used with safety for crops such as rice, sugar beets, cole crops, carrots, celery, horseradish, onions, and parsley. In order to measure the amount of active ingredient in the technical product, melting and filtering are necessary to remove 2,4-dichloro- 1-(4-nitrophenoxy) benzene. This is followed by gas chromatography of a diluted portion of the melt. Residue analysis for nitrogen can be conducted by extracting the sample with dichloromethane. After drying the extract, the residue is dissolved in an organic solvent and passed through a Florisil column to be later measured by gas-liquid chromatography using an electron capture detector. The sensitivity of the method is 0.01 ppm. There is also an amine method which calls for the digestion of the terminal residues with hydrochloric acid and zinc to yield 2,4-dichloro- 1-(4-aminophenoxy) benzene which is then derivatized to 2,4-dichloro- (4-heptafluoro butyramidophenoxy) benzene. This second compound is purified and measured by electron capture gas-liquid chromatography.

**79-1461.** Brady, S. S.; Van Hoek, C.; Boyd, V. F. (Sandoz, Inc., Homestead, FL) **Norflurazon.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 37): 415-435; 1978. (2 references)

Norflurazon can be used as a preemergence herbicide and is safe for use on cotton, cranberries, fruits, and nut crops. The chemical inhibits photosynthesis by inhibiting the biosynthesis of carotenoids. UV spectrophotometry or gas chromatography is used for analyses of technical and formulated material and thin-layer chromatography is used for identification. For residue analysis, the sample is extracted in a Soxhlet extraction apparatus followed by cleaning through the use of solvent partition and alumina column chromatography. Dissolution in benzene is followed by gas chromatography quantification using an electron capture detector. Special considerations for extraction of the sample from various environmental samples are listed including steps for sample processing of soil, green crops and fruits, nuts, dry foliage, and water.

**79-1462.** Green, C. D. (Commer. Chem. Div., 3M Co., St. Paul, MN) **Perfluidone.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 38): 437-450; 1978. (1 reference)

Perfluidone is a highly effective herbicide in controlling yellow and purple nutsedge, most annual grasses, and certain broadleaf weeds. For analysis of formulation, perfluidone can be easily determined by methylation of the sulfonamido group with diazomethane followed by gas chromatography. For analysis of perfluidone residues in soil, and in cottonseed, the sample is extracted with an appropriate solvent system. Florisil column chromatography is used to remove undesirable coextractives. Removal of the solvent from the perfluidone-containing eluate is followed by methylation with diazomethane. Gas chromatography with an electron capture detector is used for the analysis. The sensitivity of the method is 0.01 ppm. Average recoveries are in the 0.01 to 4 ppm range at greater than 90%.

**79-1463.** Kahrs, R. A. (Agric. Div. Ciba-Geigy Corp., Greensboro, NC) **Profluralin.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds (Academic Press: NY) 10(Chapter 39): 451-459; 1978.

Profluralin acts through absorption into the roots and shoots of germinating seedlings and inhibits growth processes. It is suspected that the chemical interferes with both the photosynthesis and respiration of weeds. The chemical can be safely used among such crops as cotton, soybeans, peanuts, dry beans, alfalfa, and other agronomic and vegetable crops. Analysis for formulations of the chemical include gas chromatography using a flame ionization detector. The internal standard is dibutyl phthalate. For residue analyses profluralin is extracted from plants with methanol and from soil with 10% aqueous methanol. By diluting the methanol extracts, partial cleanup is achieved. Cleanup is performed in a Florisil column using *n*-hexane elution. Gas chromatography with electron capture detection is employed for the determination of profluralin. Typical recoveries are 90 to 110% for soil, 75 to 90% for cotton and soybeans, and 60 to 90% for cottonseed and soybean oil, each at fortification levels from 0.05 to 2.0 ppm.

**79-1464.** Wyckoff, J. C. (Agric. Div. Am. Cyanamid Co., Princeton, NJ) **Prowl herbicide.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 40): 461-482; 1978. (6 references)

Prowl is used as an effective preemergence or preplant herbicide to control annual grasses and various broadleaf weeds by preventing growth of the germinated weed seedling. Formulation analysis calls for the dilution of liquid samples with chloroform and subsequent determination by gas-liquid chromatography using an internal standard technique. The chemical can also be quantitated by thin-layer procedures which call for the separation of the chemical from known visible absorbing contaminants, accomplished by thin-layer chromatography. The band corresponding to the herbicide is scraped from the plant, extracted from the silica gel, and quantitated spectrophotometrically. The recommended residue analysis method calls for extraction of the residue including metabolites, from foliage with aqueous acid-methanol, when the sample was one of foliage. For seed and meal samples, extraction is conducted using chloroform-methanol, and for oil samples, extraction is achieved using hexane. Gas-liquid chromatography with electron capture detector is used for the final determination.

**79-1465.** Pease, H. L.; Leitch, R. E.; Hunt, O. R. (Biochem. Dep., E. I. duPont de Nemours & Co., Inc., Wilmington, DE) **Terbacil.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 41): 483-492; 1978. (3 references)

Terbacil is used as a weed killer for the protection of alfalfa, apples, blueberries, peaches, citrus fruits, mint and sugar cane crops. The herbicide possesses a low mammalian toxicity and is commercially available as a wettable powder containing 80% of the active ingredient. For analysis of the formulated product a liquid chromatographic (LC) procedure is recommended which calls for the dissolving of the sample in the LC mobile phase containing an internal standard. The dissovled sample is then eluted from an LC column. Ultraviolet absorbance of the eluate is monitored and component peak areas are electronically integrated. The concentration of the sample is determined by a comparison of area ratios with those of analytical standard samples. In an alternate method the sample is extracted with acidified dichloromethane, and subsequently analyzed by infrared spectrophotometry. For analysis of terbacil residues, programmed temperature microcoulometric gas chromatography is used to measure the intact compound after it has been extracted from the sample. This extraction is accomplished by an alkaline solution and the extract is purified by solvent partitioning cleanup. A Florisil column can be used to achieve additional cleanup. The method is sensitive to about a 1 μg amount of terbacil or a limit of detection of 0.04 ppm based on a 25 g sample. Essentially quantitative recoveries have been obtained over the range of 0.04 ppm to 10 ppm on a wide range of samples which includes both plant and animal tissues as well as various soil types.

**79-1466.** Tweedy, B. G.; Kahrs, R. A. (Agric. Div., Ciba-Geigy Corp., Greensboro, NC) ***s*-Triazines.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 42): 493-520; 1978.

The common names of the various *s*-triazines include simazine, atrazine, propazine, ametryne, terbutyne, prometryne, dipropetryne, and prometone. These chemicals are in general applied as pre- or post-emergence herbicides for weed control in agricultural and industrial areas. The recommended method of analysis of *s*-triazine formulations is determination by flame ionization gas chromatography. For residue analysis the triazine residues are extracted from green crops by blending with chloroform, and from dry crops and soil by reflux with acetonitrile:water in a 9:1 ratio (volume to volume). Cleanup is accomplished by column chromatography using aluminum oxide. Final determination is by gas chromatography and element specific detectors.

**79-1467.** Amadori, E.; Heupt, W. (Rohm & Hass Co., Spring House, PA) **Chlorflurecol-methyl.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 43): 525-532; 1978. (3 references)

Chlorflurecol-methyl is a growth-retarding and suppressing agent transported through the plant either by the leaves or the roots. It can retard excessive turf and is used frequently in combination with maleic hydrazide. It shows promise for increasing the yield of cucumbers and enhancing the propagation of pineapple slips. Chlorflurecol-methyl is formulated as 5 and 12.5% weight by volume emulsion concentrates and is also available in fertilizer granules coated with herbicide-chlorflurecol-methyl combinations. For formulation analyses a sample is spotted on thin-layer chromatography plates. The three compounds are separated, removed from the plate by elution and read for absorbance at the maxima. These three components are methyl-2-chloro-9-hydroxyfluorene- (9)-carboxylate, methyl-2,7-dichloro-9-hydroxy-fluorene- (9)-carboxylate, and 15-20% methyl-9-hydroxyfluorene- (9)-carboxylate, which are present, respectively, in amounts approximating 70, 15, and 20%. Residue analysis may be accomplished colorimetrically, by thin-layer chromatography, and by gas chromatography. For colorimetric determinations, the chlorfluorenone is reacted with *p*-nitrophenyl hydrazine and the resulting hydrazone is measured at a wavelength of 585 nm. On thin layer plates, chlorfluorenone is separated and quantitatively determined with a scanner. For gas chromatography, the simultaneous determination of chlorflurecol and chlorfluorenone is carried out by electron capture detection.

**79-1468.** Green, C. D. (Commer. Chem. Div., 3M Co., St. Paul, MN) **Fluoridamid.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 44): 533-543; 1978. (1 reference)

Fluoridamid is a plant growth regulator effectively

retarding growth and suppressing seedhead formation of a large number of grasses. The product reduces or eliminates turf maintenance requirements in various places. The fluoridamid and its diethanolamine salt formulation have low acute toxicity when administered orally, dermally, or by inhalation. Fluoridamid does not irritate the skin or eyes, and it shows no teratogenic or mutagenic potential. For formulation analysis, fluoridamid is readily determined by gas chromatography after methylation of the sulfonamido group with diazomethane. Sustar 2S formulations are analyzed after their acidification and the removal of water. The dry residue is reacted with diazomethane, *o*-diphenyl phthalate internal standard in chloroform is added, and the resultant solution is analyzed by gas chromatography flame ionization detection. Residue analysis for soil samples involves the extraction with an azeotrope of acetonitrile:water, Florisil column chromatographic cleanup, diazomethane methylatin, and gas chromatographic determination with electron capture detection.

**79-1469.** Ottnad, M.; Jenny, N. A.; Roeder, C. H. (Schering AG, Berlin, BRD) **Methyl isothiocyanate.** In: *Analytical Methods for Pesticides and Plant Growth Regulators.* Zweig, G., Sherma, J., eds. (Academic Press: NY) 10(Chapter 46): 563-573; 1978. (4 references)

Methyl isothiocyanate is used as a soil fumigant to control nematodes, soil fungi, insects, and weeds. Two recommended methods are available for formulation analysis. The major method is a potentiometric titration method in which methyl isothiocyanate is converted by *n*-butylamine to *n*-butylmethylthiourea, which is titrated potentiometrically with silver nitrate solution. A more specific quantitative determination is made by gas-liquid chromatography. For this method methyl isothiocyanate is determined using *m*-xylene as the internal standard and comparing the peak area of the unknown sample to the peak area of a standard. Several methods are available for the determination of methyl isothiocyanate in crops and soils, each of which is based on a gas chromatographic determination of the active compound after extraction with an organic solvent.

**79-1470.** Goursaud, J.; Scriban, R. (Ec. Natl. Super. Ind. Agric. Aliment., F-95909 Douai, France) **Dosage des residus de pesticides dans les bieres. [Determination of pesticide residues in beer.]** *Ann. Nutr. Aliment.* 32(5): 975-979; 1978. (2 references) (French)

Procedure for the determination of pesticide residues in beer is described. The method is based on the determination of pesticides in water. The pesticides are extracted with petroleum ether during agitation, and the froth is broken with acetonitrile. The ether solutions are concentrated *in vacuo*, and purified on a hydrated Florisil column, using three different eluents (petroleum ether with 6% ethyl ether, petroleum ether with 15% ethyl ether, and petroleum ether with 50% ethyl ether). The eluates are concentrated *in vacuo*, and analyzed by a gas chromatographic method, using electron capture detection for organochlorine compounds, and thermoionic detection for organophosphorus compounds. The use of two columns ($QF_1$ and DC 200 or DEGS, $H_3PO_4$) permits both qualitative and quantitative determination.

**79-1471.** Hylin, J. W.; Kawano, Y.; Chang, W. (Dep. Agric. Biochem., Univ. Hawaii, Honolulu, HI) **An ultraviolet absorption method for the analysis of maneb formulations.** *Bull. Environ. Contam. Toxicol.* 20(6): 840-845; 1978. (15 references)

A new method for the measurement of maneb is described. The tetrasodium salt of ethylene dinitrolo tetraacetic acid is used to convert the maneb to nabam, a water solution ethylenebis dithiocarbamate. After the interfering products are removed by extraction with ethyl acetate, chloroform and carbon disulfide, the absorption of the converted maneb is measured at 284 nm. A formula is given for calculation of the % maneb. It is shown that the results obtained with the method are comparable to those obtained with the traditional carbon disulfide method. The technique is applicable to polyram formulations, but not to zineb formulations.

**79-1472.** Kato, S. (Jpn. Anal. Cent. Foods, Tokyo, Japan) **[Multi-residue analytical method for detecting *N*-methylcarbamate insecticides by gas-chromatography of their monochloroacetyl derivatives.]** *Bunseki (Analysis)* .3: 145-153; 1979. (33 references) (Japanese)

A method for the determination of residues of *N*-methylcarbamate insecticides is described. After crushing the specimcn (grains, wheat, or legumes), it is extracted with aqueous acetone, filtered, and concentrated. The residue is dissolved in 5% aqueous sodium chloride solution and extracted repeatedly with hexane. After dehydrating the hexane layer, the solvent is evaporated and the residue is dissolved in acetone. The insecticide residue is then transferred to dichloromethane and thin layer chromatography is carried out to isolate each *N*-methylcarbamate. Specimens recovered from the chromatogram are hydrolyzed with 0.25 *N* aqueous sodium hydroxide solution and, after monochloroacetylation, the samples are injected into a gas-chromatograph equipped with ECD to be compared with the standard calibration curves of the authenitc compounds. The detection limit of *N*-methylcarbamates by this method is 0.01-0.05 mg, and the detection limit of concentration in crops is 0.001-0.005 ppm. *N*-Methylcarbamates detected by this method include *m*-tolyl, *o*-cumenyl, *o*-sec-butylphenyl, *m*-tert-butylphenyl, 3,4-xylyl, 3,5-xylyl, 5-isopropyl- 3-methylphenyl, *o*-iospropoxyphenyl, and 1-naphthyl esters.

**79-1473.** Bardodej, Z. (Out-Patient Fac. Hyg., KU, Prague, Czechoslovakia) **Hodnota a pouziti expozicnichtestu. XVII. Stanoveni pentachlorfenolu v moci. [The value and application of exposure tests. XVII. The determination of pentachlorophenol in urine.]** *Cesk. Hyg.* 23(9): 418-421; 1978. (27 references) (Czech)

A spectrophotometric method of the reaction product of pentachlorophenol (PCP) with 4-aminoantipyrine is

described which is designed to detect pentachlorophenol in urine. The claim is made that this method is more sensitive and faster than gas chromatography. Acute symptoms of poisoning appear when the fungicide is present in the blood at a level of 4-8 mg/100 ml. The CSSR maximal permissible level in urine is 2 mg/l. Pentachlorophenol is eliminated for weeks both in urine and in the feces largely unchanged. For determination, a urine sample is acidified and distilled with steam. A buffer and a 4-aminoantipyrine solution are added and stirred, then a solution of potassium hexacyanoferrate and xylene are added. Following mixing, the photometric value of the xylene layer is read at 570 nm in a 1 cm optical path cuvette against a blend prepared by processing water instead of urine according to the above procedure.

**79-1474.** Renner, G.; Schuster, K. P.; Kuhnhen, H. B.; Stachel, H. D. (Pharmacokol. Inst., Univ. Munchen, D-8000 Munich 2, BRD) **Isolierung von Stoffwechselprodukten der Pestizide Hexachlorbenzol und Pentachlornitrobenzol aus Harn and Faceces von Ratten und Kaninchen. Anwendung der simultanen Wasserdampfdestillation-Extraktion nach Schulz et al. als Trenn- und Reinigungsverfahren. [Isolation of hexachlorobenzene and pentachloronitrobenzene metabolites from urine and feces of rats and rabbits. Application of the simultaneous steam distillation-extraction method according to Schulz et al. for separation and purification.]** *Chemosphere* 7(12): 943-947; 1978. (10 references) (German)

The determination of BHC metabolites in the urine and feces of rats fed BHC (100 mg, 2x/wk), and of pentachloronitrobenzene (PCNB, quintozene) metabolites in the urine of rabbits fed PCNB (single 2 g dose) was studied. *n*-Hexane or ether was used as a solvent, and simultaneous distillation and extraction was applied. The metabolites were identified by IR, UV, NMR and mass spectrometry. The metabolites of BHC were identified as 1,2,3,4-tetrachlorobenzene (in urine), 1,2,4,5-tetrachlorobenzene (urine), 2,4,5-trichlorophenol, and 1,3,5-trichlorobenzene (urine and feces). *N*-Acetyl-*S*-(pentachlorophenyl) cystein was identified as a metabolite of PCNB.

**79-1475.** Sundstrom, G.; Jansson, B.; Renberg, L. (Spec. Anal. Lab., Natl. Swed. Environ. Prot. Board, Wallenberg Lab., Univ. Stockholm, S-10691 Stockholm, Sweden) **Determination of the toxic impurities 3,3′-4,4′- tetrachloro azobenzene and 3,3′-4,4′-tetrachloro azoxybenzene in commercial diuron, linuron and 3,4-dichloroaniline samples.** *Chemosphere* 7(12): 973-979; 1978. (13 references)

Eight herbicide preparations and four 3,4-dichloroaniline products were analyzed by a procedure based on gas chromatography and mass spectrometry for the determination of TCAB and TCAOB as contaminants. The formulations were extracted with acetone. After the solvent was removed, the residue was partitioned between methanol:water and hexane. Products from 3,4-dichloroaniline were partitioned between methanol, 1*M* hydrochloric acid and hexane. Hexane extracts were purified by column chromatography on silica gel and analyzed by gas chromatography with electron-capture detection. Detection limits were 0.1 μg/g using samples of 1 g. TCAB concentrations ranged from 5.5 to 28 μg/g of herbicide formulation. The concentrations of TCAOB/g formulation ranged from 1.9 to less than 0.05 μg. TCAB was found at levels of 2.4 to 460 μg/g of 3,4-dichloroaniline. TCAOB levels were below the detection limits in the 3,4-dichloroaniline samples.

**79-1476.** Erk, S. D.; Taylor, M. L.; Tiernan, T. O. (Grehm Lab. & Dep. Pharmacol. & Chem., Wright State Univ., Dayton, OH 45435) **Determination of 2,3,7,8-tetrachlorodibenzo-*p*- dioxin residues on metal surfaces by GC-MS.** *Chemosphere* 8(1): 7-14; 1979. (7 references)

A method is described for the determination of TCDD on metal surfaces such as barrels and tanks used for the storage of 2,4,5-T products. Two sampling procedures may be used. One involves wiping the sampling surface with filter paper wetted with a 1:5 mixture of benzene:hexane. After extraction of the filter paper, and mini-column cleanup, the TCDD fraction is analyzed by GC-MS techniques. The second procedure involves scraping the permeable metal surface layers until the bright metal surface underneath is visible. A 0.25 g portion of this sample is extracted into a 1:5 mixture of methylene chloride:hexane twice and the combined extracts are centrifuged to remove fine particulate. As in the first method, the TCDD fraction is separated on a micro-column and then analyzed by GC-MS techniques specific for trace dioxins in environmental and pesticide samples. Average recoveries for the wipe and scrape methods were 88% and 80.5%, respectively, with detection limits as low as 5 ng/g for the scrape procedure.

**79-1477.** Friesen, M. D. (Kansas State Univ., Manhattan, KS) **Application of negative chemical ionization mass spectrometry to the analysis of bovine tissue for chlorodibenzo-*p*-dioxins and related compounds.** *Diss. Abstr. Int. B* 39(1): 197; 1978.

A more rapid extraction and clean-up method used in combination with dioxin quantitation by gas chromatography-methane negative chemical ionization mass spectrometry (MNCI-MS) is described. Two sets of liver and fat tissue samples from a dairy herd housed in a barn constructed of PCP-treated lumber were analyzed by this method and results were compared with those obtained with electron-impact mass spectrometry when dioxin levels were sufficiently high. Also dioxin-specific peaks resulting from dioxin-oxygen ion-molecule reactions were monitored to further characterize and confirm the identity of the various dioxin and furan isomers detected. A liver sample from the cattle and a wood sample of the barn housing the cattle in question were compared by MNCI-MS with results that showed that higher chlorinated dioxin isomers were found more frequently in the wood than in the liver sample. This method was shown to be highly sensitive and specific for the detection and quantitation of chlorodibenzo-*p*-dioxins and related compounds in biological and environmental samples. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7811416.)

**79-1478.** Bolger, M. B.; Taylor, P. (Univ. California, San Diego, La Jolla, CA 92093) **Bisquaternary ligand association with acetylcholinesterase: evidence for two conformational states from stopped-flow fluorescence quenching.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 431; 1979.

Bisquaternary ammonium inhibitors of acetylcholinesterase (AchE) in which the quaternary groups are separated by 14 angstroms bind with high affinity to the enzyme and are competitive with ligands that bind to either the active center (edrophonium) or the peripheral anionic site (propidium). A series of $C_{10}$ bisquaternary ligands containing a benzoquinone moiety exhibit absorption spectra which overlap the fluorescence emission of the tryptophanyl residues on the protein. Upon complexation quenching of protein fluorescence occurs along with a shift of emission maximum to shorter wavelength. A study of the kinetics of complexation using stopped-flow instrumentation reveals that a rapid biomolecular step is followed by a relatively slow (40/s) unimolecular interconversion of enzyme species. The unimolecular step occurs with all the bisquaternary ligands examined. However, no unimolecular step was observed for ligands which bind exclusively to the active center or peripheral anionic site; instead these ligands exhibit association kinetics approximately thatof a diffusion controlled reaction. Thus, a two-state model involvingan enzyme isomerization appears appropriate for bisquaternary ligand binding of AchE. The changes in conformation may well be associated with the necessity of obtaining the proper spatial arrangement between the two anionic sites on AchE at which the quaternary groups bind. [Abstract 1070 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1479.** Koch, R. B.; Patil, T. N.; Glick, B.; Stinson, R. S.; Lewis, E. A. (Mississippi State Univ., Mississippi State, MS 39762) **Properties of an antibody to kelevan isolated by affinity chromatography. Antibody reactivation of ATPase activities inhibited by pesticides.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 38(3, Pt. 1): 670; 1979.

Kelevan, the condensation product of ethyl levulinate and Kepone (chlordecone), was conjugated to bovine serum albumin and gamma globulin. Antibody molecules were produced by injection of BSA-Kelevan, dissolved in Freund's complete adjuvant emulsion, into chickens and rabbits. Antibodies (Ab) were obtained in pure form by affinity chromatography using BGG-Kel covalently linked to Sepharose 4B-CN. Properties of the Ab included: sedimentation coefficient = 5.7, pI = 7.0, calculated mol. wt. = 150,000, and precipitin band formation using the microouchterlony test. The Ab in free or immobilized from were able to prevent or reverse Kepone inhibition of ATPase activity. About 70 μg of purified Ab was sufficient to restore the activity of mitochondrial (ologomycin-sensitive) $Mg^2+$ ATPase activity which had been inhibited (*in vitro*) by 1 μM Kepone. The Ab were effective in preventing enzyme inhibition by other organochlorine pesticides with widely differing molecular structures. However, nonchlorinated inhibitors of mitochondrial oligomycin-sensitive $Mg^2+$ ATPase activity were much less affected by the Ab. The available evidence suggests that the antibody binding site for the hapten may be specific for secondary or induced bonding forces due to the carbon-chlorine bonds. [Abstract 2325 of the annual meeting of the Fed. Am. Soc. Exp. Biol.] (Author abstract by permission)

**79-1480.** Tewari, S. N.; Singh, R. (Toxicol. Div., Chem. Examiner's Lab., Agra 282001, India) **Identification and detection of carbamate pesticides in autopsy tissues using thin-layer chromatograpy.** *Fresenius Z. Anal. Chem.* 294(4): 287; 1979. (1 reference)

A TLC technique for the determination of carbamate compounds in extracts of autopsy samples is described. Four solvent systems, *n*-hexane:chloroform (3:1), benzene:acetone (19:1), benzene:hexane (17:3), and benzene:ethyl methyl ketone (19:1) were tested. Nine commercially available pesticides (aldicarb, Baygon (propoxur), carbaryl carbofuran, Lamate, mancozeb, thiram, ziram, and zineb) were used as standards. The tissue extracts were spotted on the TLC plates and their R*f* values were compared with those of the controls. Carbaryl and carbofuran were well resolved in solvent systems using benzene:acetone and benzene: hexane. The proposed method gave good results for the detection of up to 0.5 μg of carbamate pesticide.

**79-1481.** Muthu, M.; Rajendran, S.* (Cent. Food Technol. Res. Inst., Mysore 570013, India) **A biological method for methyl bromide assay in fumigation.** *Int. Pest. Control* 21(1): 8-9; 1979. (3 references)

Two- to three-wk old *Sitophilus oryzae* were used as concentration-time product indicators in a bio-assay method for the measurement of methyl bromide levels during fumigations. Known concentrations of methyl bromide were prepared in a dessiccator. Gas-tight glass syringes containing thirty *S. oryzae* were used to withdraw methyl bromide-air mixtures from the dissiccator. The time required for 100% knockdown of the insects was noted. These procedures were performed at 22.5 ± 2.5°C and 82 ± 6% relative humidity. Knockdown times in hr and concentrations in mg/l were plotted on double log paper. From the regression line it was possible to predict closely the concentrations related to specific knockdown times. Double logarithmic transformation rendered the plot both linear and homoscedastic. The concentration-time products for 100% knockdown as calculated from the regression line varied between 38-135 mg/hr/l as methyl bromide levels increased. Therefore, it would not be feasible to use a concentration-time product constant to compute the concentrations as described in previous research using *Tribolium castaneum* adults. A graph is given that could be used as a ready reckoner for determining levels of methyl bromide in the field where other techniques are not readily accessible.

**79-1482.** Liu, L. C.; Maldonado, C. (Author address not given) **A bioassay method for detecting herbicide concentrations in water.** *J. Agric. Univ. P. R.* 63(1): 80-83; 1979. (3 references)

A bioassay method for the determination of six commonly used herbicides in water is described. Duckweed ( *Lemna perpusilla*) was used as the indicator plant. Test concentrations for ametryne, prometryne, atrazine, and Diuron ranged from 0.00195 to 1.00 ppm. Fluometuron was tested at 0.00390 to 2.00 ppm. MSMA was tested at 0.0156 to 10.00 ppm. Data obtained at the end of the 7th day was used to construct standard bioassay curves. MSMA was the least toxic to duckweed, while ametryne and diuron were found to be highly toxic.

**79-1483.** Miller, J. J.; Sanders, E.; Webb, D. (K. R. U. F. Inst. Renal Dis., R. Infirm., Cardiff, S. Wales, England) **Measurement of paraquat in serum by high-performance liquid chromatography.** *J. Anal. Toxicol.* 3(1): 1-3; 1979. (11 references)

A rapid and reliable assay procedure for serum paraquat is described. Following extraction with chloroform and ethanol, serum samples were analyzed by high performance liquid chromatography. Recovery was 83%, and detection of concentrations as low as 200 ng/ml was possible. The application of this method to clinical situations is described.

**79-1484.** Gibbon, S. L.; Tong, H.; Miranda, P. M. S.; Way, J. L.* (Coll. Hall 5-B, Washington State Univ. Pullman, WA 99164) **Metabolism of pralidoxime (2-PAM) in man.** *J. Anal. Toxicol.* 3(1): 14-17; 1979. (26 references)

Studies were carried out on the biotransformation of pralidoxime (1-methyl-2-aldoximinopyridinium ion, 2-PAM), an alkylphosphate antagonist, in man. Male terminal cancer patients were given an intravenous dose of 20 mg/kg of pralidoxime dissolved in saline, and 24 hr urine collections were made. 60-90% of the dose was recovered unchanged from urine. Isolation of the urinary metabolite was achieved by adsorption charcoal column chromatography, ion exchange chromatography, paper electrophoresis and paper chromatography. A 1-methyl-2- cyanopyridinium ion was isolated as a urinary metabolite.

**79-1485.** Krause, R. T. (Div. Chem. & Phys., FDA, Washington, DC 20204) **Further characterization and refinement of an HPLC post-column fluorometric labeling technique for the determination of carbamate insecticides.** *J. Chromatogr. Sci.* 16(7): 281-288; 1978. (6 references)

The refinement of an HPLC method for the detection of ng levels of carbaryl, carbofuran, methiocarb, methomyl, and propoxur (and metabolites 3-hydroxycarbofuran and $\alpha$ -naphthol) is described. After separation on a $\mu$Bondapak $C_{18}$ HPLC column, NaOH is applied to the column effluent to hydrolyze the carbamates in line to methylamine with a second reaction at 100°C. The carbamate hydrolysis product is reacted with a solution of 0.5 mg *o*-phthalaldehyde and 1 $\mu$l 2-mercaptoethanol/ml. The fluorophore which results is monitored with a fluorescence detector using a 10 $\mu$l cell. A 50% full scale deflection (FSD) was obtained in the following amounts: carbaryl, 26; carbofuran, 42; 3-hydroxycarbofuran, 30; methiocarb, 51; methomyl, 12; $\alpha$-naphthol, 52; and propoxur, 36. Linear detector responses were achieved from 5-90% FSD. Relative standard deviations in peak height responses and peak retention times for the seven compounds were 3.5 and 1.0%, respectively in a seven-day system stability study. The performance of the system indicates that it would be useful for the detection of ng levels of residues of these carbamate compounds.

**79-1486.** Heedham, L.; Rollen, Z. J.; Paschal, D.; Liddle, J.; Bayse, D. (Toxicol. Branch, Div. Clin. Chem., Bur. Lab., CDC, Atlanta, GA) **Determination of paraquat in marijuana by reversed-phase paired- ion high performance liquid chromatography.** *J. Chromatogr. Sci.* 17(2): 87-90; 1979. (10 references)

Paraquat-sprayed marijuana samples were ground and added to 200 $\mu$g of 1,1′-diethyl-4,4′-bipyridinum diiodide in 2 ml aqueous solution, and 10 ml 6*N* HCl. After soaking for 30 min and sonification twice, acidic solutions were extracted with chloroform:isopropanol (9:1). The residues of the aqueous phase were dissolved in phosphate buffer (pH 7) and centrifuged at 2,000 rpm for 10 min. A 1.0 ml portion was sent through a $C_{18}$ SEP-PAK TM. Injection volumes of 25 $\mu$l were fed into a Waters Assoc. Model ALC/GPC 204 LC equipped with two Model 60000 A pumps, a Model 440 detector, and a U 6K $\mu$ Bondapak C18, and an ion pairing reagent in the mobile phase. The recovery of paraquat in laboratory-spiked samples was 90-97%. Results from field-sprayed marijuana were in good agreement with those obtained in UV procedures. The calculated limit of detection with this method is 2 ng of paraquat. The extent of interference by herbicides was evaluated using 18 different compounds. Only diquat and cyanazine eluted closely enough to cause interference, however, this problem could be avoided by increasing the amount of water in the mobile phase.

**79-1487.** Brodtmann, N. V.; Koffskey, W. E. (Jefferson Parish Water Dep., Jefferson, LA) **Use of high resolution glass capillary columns for the analysis of pesticides in river and drinking water.** *J. Chromatogr. Sci.* 17(2): 97-110; 1979. (8 references)

Modification of batch extraction methods and the use of gas capillary columns (GCC) in a gas chromatograph for the routine analyses of extremely low levels of chlorinated pesticides are described. A Varian 1440 GC equipped with an electron capture detector was used for this work. An all-glass lined variable inlet splitter was installed for use with capillary columns. Well coated open tubular (WCOT) capillary columns, 60 m x 0.25 mm, coated with SE-30 and having no less than 150,000 effective plates were used. Water samples were collected from the Mississippi River at raw water intakes of a waterworks complex. The vastly superior resolution produced by the GCC not only permits the analysis of sample extracts without prior column chromatography clean-up, but also permits resolution of certain insecticide pairs not resolvable on commonly used packed columns. Over a period of three mo 60 mixed standards and 220 sample extracts were

injected into the WCOT column without significant changes in the number of effective plates (N*eff*) vs. retention time. Recoveries of chlorinated hydrocarbon insecticides ranged from 67% for hexachlorobenzene, to 95% for endosulfan II. Detection limits on 10 ft packed column ranged from 0.4 pg for hexachlorobenzene to 9.1 pg for *o,p'*-DDT.

**79-1488.** Lawrence, J. F.; Turton, D. (Food Res. Div., Health Prot. Branch, Ottawa, Ont., Canada) **High-performance liquid chromatographic data for 166 pesticides.** *J. Chromatogr.* 159(2): 207-226; 1978. (42 references)

High-pressure liquid chromatographic data of 166 pesticides and related compounds are tabulated. Included are chromatographic conditions such as type of packing material, column dimensions and mobile phase composition. Elution volumes or capacity factors are listed as a measure of compound retention. The types of substrate and detectors used for the anlaysis are also included. Where UV detectors were employed, the wavelength used is also given. (Author abstract by permission)

**79-1489.** Vysotskaia, R. U.; Strelkova, A. A.; Lizenko, E. I.; Sidorov, V. S. (Inst. Biol., Karelian Branch, USSR Acad. Sci., Bashkir, USSR) **Opredelenie maloletuchikh efirov 2,4-D v pochve. [Determination of low-volatile ethers of 2,4-D in soil.]** *Khim. Sel'sk. Khoz.* 16(10): 46-47; 1978. (4 references) (Russian)

A modified assay (similar to the method used for lipid determination) for the determination of residues of 2,4-D ethers in the soil is described. The method is based on the formation of hydroxamic acids, and consists of extraction, purification of the extracts, treatment with the reagents that contain hydroxylamine and ferric chloride, and colorimetry. The sensitivity of assay was 20 μg/10-20 g soil sample.

**79-1490.** Krasnykh, A. A. (All-Russ. Res. Inst. Plant Prot., Leningrad, USSR) **Khromatograficheskoe opredelenie pirimifos-metila v vode, pochve i rasteniiakh. [Chromatographic determination of pirimiphos-methyl in water, soil and plants].** *Khim. Sel'sk. Khoz.* 16(11): 36-37; 1978. (Russian)

A quantitative assay for determination of residues of the insecticide pirimiphosmethyl (*O,O*-dimethyl- *O*-(2-diethylamino- 6-methylpyrimidyl-4) thiophosphate) in water, soil and plants is described. The method consisted of extraction of the preparation by chloroform, purification of the extract in the chromatographic column and thin layer chromatography. Sensitivity of the assay ranged from 2 to 3 μg/sample. Extractability of the insecticide ranged from 83% to 94%.

**79-1491.** Kofanov, V. I.; Uskova, L. A.; Raskin, M. S. (Inst. Colloid Chem. & Chem. Water, Kiev, USSR) **Gazokhromatograficheskoe opredelenie necviazannogo dialena v vode, pochve i rasteniiakh. [Gas-Chromatographic determination of free dialene in water, soil and plants].** *Khim. Sel'sk. Khoz.* 16(11): 40-43; 1978. (10 references) (Russian)

A highly sensitive gas chromatographic assay was employed for the determination of residues of free (unbound to amino acids and carbohydrates) Dialene (dicamba and 2,4-D in a 10:1 ratio) in water, soil, and plants. The method permits the assay of both components of Dialene in one sample. The sensitivity of the method was 5 μg/l for water, 10 μg/kg for soil, straw and foliage, and 20-50 μg/l for grain. Detectability was 90% in water, 82-85% in soil, straw and foliage, and 78-82% in grain. Determination of the content of Dialene in oats within various periods after application at 0.9 kg/ha, 0.7 kg/ha and 1.8 kg/ha showed that, at 1 wk after spraying, the content of Dialene decreased from 97.5-275 mg/kg to 29-146 mg/kg (the rate of Dialene degradation was dose-dependent). At 2 mo after application, only trace amounts of the herbicide were found in the oats.

**79-1492.** Timofeeva, O. A.; Shvartsman, G. A. (Moldavian Res. Inst. Food, Ind., Kishinev, USSR) **Gazokhromatograficheskii metod opredeleniia tsidiala. [Gas-chromatographic determination of Cidial].** *Konservn. Ovoshchesush. Prom.* 9(11): 39-40; 1978. (Russian)

Gas chromatography was employed for determination of the insecticide Cidial (ethyl ether of *O,O*-dimethyl dithiophosphoryl-1- phenylacetic acid, Phenthoate) residues in fresh grapes and plums, grape juice and stewed plums. The sensitivity of the assay was 1-2 μg of Cidial in a 50 g sample. The extractability of Cidial was 89.1%. The duration of the analysis was 1.5-2 hr.

**79-1493.** Fodorne Csorba, K.; Komives, T.; Marton, A. F.; Dutka, F. (Cent. Chem. Res. Inst., Hungarian Acad. Sci., Budapest, Hungary) **Tiokarbamat herbicidek vekonyreteg-kromatografias kimutatasa. [Detection of thiocarbamate herbicides by thin-layer chromatography.]** *Magy. Kem. Foly.* 84(11): 526-527; 1978. (7 references) (Hungarian)

A sensitive TLC method for the detection of the thiocarbamate herbicides eptam, butylate and cycloate is described. The chromatogram is developed on a silica gel 60 TLC plate with a mixture of *n*-hexane, ether and acetic acid (90:9:1). Then, the spots are visualized by spraying with 2,6-dibromo-*N*- chlorobenzoquinone imine or *N*-2,6-trichloro- benzoquinone amine solution in acetic acid (1 wt %), after which the TLC plate is maintained at 110°C for 10 min. The spots appear yellow against a white background. The sensitivity is 50 ng for all three herbicides. The R*f* values are 0.36 for eptam, 0.46 for butylate, and 0.41 for cycloate. The method is also suitable for a semiquantitative determination.

**79-1494.** Itagaki, Y. (Appl. Cent., Sci. Instrum. Proj., JEOL Ltd., Tokyo, Japan) **[Recent advances of GC/MS analysis in the pesticides and environmental toxic materials.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 3(Suppl.): 511-521; 1978. (14 references) (Japanese)

A review of recent advances in gas chromatography and mass spectroscopy in the determination of minute

amounts of pesticides is given. Several analyses are explained, such as trichlorfon, and fenitrothion determination by gas chromatography, identification of mixtures, of *O,O,S*- trimethyl phosphorodithioate, *O,O,*-diethyl *S*-methyl phosphoro dithioate, and *O,O,S*- triethyl phophoro dithioate by ultra high resolution mass and analysis of bromacil by mass-fragmentography.

**79-1495.** Nishi, K.; Tan, N.; Hattori, M. (Chem. Res. Lab., Cent. Res. Div., Takeda Chem. Ind. Ltd., Osaka, Japan) **[Micro-determination of an insecticide, cartap hydrochloride, 2-dimethyl- aminotrimethylene *S,S'*- bis (thiocarbamate) hydrochloride in soil.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 4(1): 29-35; 1979. (8 references) (Japanese)

It has been found that 2-dimethyl aminotrimethylene *S,S'*-bis (thiocarbamate) hydrochloride (cartap) and its hydrolysate 2-dimethylamino 1,3-propanedithiol are adsorbed onto soil by their functional groups. According to the method proposed the hydrochloride is extracted from soil with HCl containing 1.5% L-cystein hydrochloride at 65°C. The extract is hydrolyzed with 1.5% $NH_4CH$ and then oxidized with to give 4-dimethylamino 1,2-dithiolane. The oxidation product was injected into a gas-chromatograph with 5% PEG-20M on Chromosorb W and EFP plus Sulfur filter. The peak height was compared with that of the authentic specimen, and the amount detected was used to calculate the amount of the parent insecticide present. The recovery was 97% with a minimum detection limit of 0.05 ppm. It was also noted that the insecticide, when applied to paddy fields or upland fields, showed a half-life of less than 3 days.

**79-1496.** Prescott, A. M.; Cooke, M. (Sch. Chem., Univ. Bristol, Bristol BS8 1TS, England) **Application of carbon-skeleton gas chromatography to the analysis of polychlorinated compounds.** *Proc. Analyt. Div. Chem. Soc.* 16(1): 10-12; 1979.

Analysis of fat soluble organochlorine pesticides has been very difficult as PCB's and PCN's are very similar. Carbon-skeleton GC analytical techniques are based on the principle that sulfur, nitrogen, oxygen, and halogens in organic compounds can be replaced by hydrogen, while unsaturated bonds can be made saturated by passing them over a heated catalyst in a stream of hydrogen. A column containing either neutral 3% paladium, or a 5% platinum catalyst was used under a stream of hydrogen at 120, 240, and 310°C, respectively. At low temperatures hydrogenation of aromatic rings occurred, while an increase in biphenyl yields occurred at higher temperatures. At 305°C, biphenyl was the only product when Arochlor was used. At low temperatures loss of chlorine was followed by, or coupled with hydrogenation of the aromatic rings. At 305°C, PCN's were converted into naphthalene; polychlorinated terphenyls (PCT's) were converted into a mixture of *o,m*, and *p*-terphenyls. Environmental samples from estuarine sediments were extracted by steam distillation following by exposure to carbon-skeleton GC with a 3% palladium catalyst. Among the compounds identified were PAH's (including naphthalene, biphenyl, phenanthrene, fluoroanthrene, pyrene, and chrysene), PCB's, and PCN's. Only trace quantities of the DDT dechlorination product, diphenylethane were found.

**79-1497.** Rus, V. (Author address not given) **Determinarea unor erbicide ureice prin cromatografie de lichide de inalta performanta. [Determination of some urea herbicides by high-performance liquid chromatography.]** *Rev. Chim. (Bucharest)* 29(11): 1088-1089; 1978. (6 references) (Rumanian)

The direct determination of urea herbicides by high-performance reversed-phase liquid chromatography is described. A chromatograph with UV detector (254 nm), chromatographic column filled with Vydac ODS 10 μ, methanol-water (1:1) as an eluent, and methanol as a solvent for the samples were used. The injection pressure was 160 atm. It was possible to separate a mixture of metoxuron, monuron, fluometuron, metabromuron, diuron, Benzomarc (phenobenzuron), linuron and maloran (chlorbromuron) in 19 min. The retention times were found to be 3.3 min for metoxuron, 4.88 min for monuron, 6.57 min for fluormeturon, 8.03 min for metabromuron, 10.73 min for diuron, 14.37 min for Benzomarc, 15.38 min for linuron, and 18.42 min for maloran. The detection limits ranged from 5 ng (monuron) to 20 ng (maloran). The method is suitable for determining urea herbicide residues in the soil and food products.

**79-1498.** Carlstedt-Duke, J.; Elfstrom, G.; Snochowski, M.; Hoegberg, B.; Gustafsson, J. A. (Dep. Chem., Karolinska, Inst., S-104 01 Stockholm 60, Sweden) **Detection of the 2,3,7,8-tetrachloro dibenzo-*p*- dioxin (TCDD) receptor in rat liver by isoelectric focusing in polyacrylamide gels.** *Toxicol. Lett.* 2(6): 365-373; 1978. (14 references)

A new stereospecific polyacrylamide gel technique using isoelectric focusing of the peaks is described for the detection of the 2,3,7,8- tetrachloro dibenzo-*p*- dioxin (TCDD) binding protein (receptor protein) in rat liver cytosol and serum. The receptor protein focuses at a varying pI possibly due to aggregation. When proteolysis of the receptor is carried out, single sharp peak focusing of the receptor at pI 5.55-5.25 is achieved. This allows separation of the receptor from a serum TCDD-binding protein (pI 5.7-5.8) which is resistant to treatment with dextran-coated charcoal. 2,3,7,8-Tetrachloro dibenzofuran, 3-methylcholanthrene and β-naphthoflavone (but not phenobarbital or PCN) compete for the site of binding on the receptor with [$^3$H] TCDD. This technique may also be used for the quantitation of the TCDD receptor.

**79-1499.** Rolencova, H. (Statni Vet. Inst., CS-30000, Plzen, Czechoslovakia) **Stanoveni nekterych pesticidnich latek v biologickem materialu. [Determination of some pesticides in biological material.]** *Veterinarstvi* 28(4): 177/79; 1978. (Czech)

The possibility of detecting 2-methyl- 1-chlorophenoxy acetic acid (MCPA), the active ingredient of many growth stimulating herbicides, by a modification of the standard method for the detection of coumarin derivatives was studied on guinea pigs. A homogenized liver sample is repeatedly extracted with alcohol-ether. This extract is in turn converted to a chloroform extract which is dried. An ethyl alcohol:2 *N* $NH_4OH$ solution is analyzed by thin layer chromatography on a Silufol plate with the mobile phase consisting of *n*-butanol plus 2 *N*$NH_4OH$ in a 2:1 ratio. In the case of urine the hydrolysate is extracted by ether and then the same procedure is used. extract. The sensitivity of the method is adequate for toxicological purposes. The detection threshold is 2 ppm. While the liver constitutes a more suitable test material, intoxication can be detected earlier in urine. MCPA is not metabolized in homoiothermic animals.

**79-1500.** Harrington, K. J. (Div. Chem. Technol., CSIRO, Melbourne, Australia) **The detection of paraquat (dichloride) in wood by pyrolysis vapour-phase chromatography.** *Wood Sci. Technol.* 13(1): 21-28; 1979. (25 references)

Various methods of paraquat analysis are reviewed. Mass fragmentography of the dichloride salt of paraquat showed that the salt undergoes loss of methyl chloride readily, and this product might be useful to determine the level of paraquat after thermal degradation of paraquat dichloride in woody products. A vapor-phase chromatographic technique is suggested for the analysis of paraquat dichloride in wood based on the detection of methyl chloride after the pyrolysis. Experimental trials on *Pinus radiata* sawdust containing paraquat showed that the detection of the herbicide could be managed even when very low levels of the compounds were present.

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PESTICIDES ABSTRACTS

QUARTERLY INDEX

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## PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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